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**Posttraumatic stress following childbirth and maternal perceptions  
of the mother-infant bond: the role of attachment experiences and  
metacognition**

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**Doctorate in Clinical Psychology**

**The University of Edinburgh**

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## **Dedications**

This thesis is dedicated to my parents and sisters, my partner Al and my friends, particularly Jenny. I would never have embarked on this course without their support and encouragement.

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TOTAL WORD COUNT: 29 943

## OVERVIEW

This research portfolio is comprised of a systematic review and an empirical study. The systematic review ‘A cognitive approach to posttraumatic stress following childbirth: A systematic review’ is presented in Chapter 1. The remaining chapters relate to the major empirical study. The second chapter, the bridging chapter outlines some of the theoretical constructs, psychological models and research related to the empirical study. The methodology is reported in the third chapter. This is followed by a journal article entitled ‘Posttraumatic stress following childbirth and maternal perceptions of the mother-infant bond: the role of attachment experiences and metacognition’ which reports the main findings of the study. Chapter 5 reports additional results to those in the journal article. The additional discussion section discusses research findings in more detail.

## **ABSTRACT: EMPIRICAL STUDY**

**Background:** Some women develop symptoms of posttraumatic stress following childbirth. There is preliminary evidence that cognitive variables may be associated with the development or maintenance of these symptoms. Research indicates that symptoms of posttraumatic stress following childbirth may have negative consequences for mother-infant relationship outcomes. However, these may be attributable to comorbid symptoms of depression. Further evidence is required regarding the nature of the relationships between these variables.

**Methods:** An internet based cross-sectional questionnaire design was employed to test hypothesised relationships between maternal attachment experiences, metacognition, symptoms of PTSD and depression and perceptions of the mother-infant bond, in an analogue sample of new mothers. Structural equation modelling was employed for the principal analysis.

**Results:** The final structural model demonstrated a good fit to sample data. Metacognition fully mediated the relationship between attachment experiences and postnatal psychological outcomes. The association between posttraumatic stress and maternal perceptions of the mother-infant bond was fully mediated by depression.

**Conclusions:** Metacognition may have a key role in the development and maintenance of postnatal psychological distress. If clinically significant postnatal depression is identified, screening for posttraumatic stress is strongly indicated.

# SYSTEMATIC REVIEW

## **A cognitive approach to posttraumatic stress following childbirth: A systematic review**

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*Written in accordance with Clinical Psychology Review author guidelines (Appendix 1)*

***RUNNING HEAD: COGNITIVE MODEL POSTTRAUMATIC STRESS AFTER  
CHILDBIRTH***

## **Abstract**

**Background:** There is evidence that a proportion of women develop clinically significant symptoms of posttraumatic stress disorder (PTSD) following childbirth, with some meeting full diagnostic criteria. It is important to establish whether current theoretical models of PTSD are applicable to posttraumatic stress following childbirth owing to potential clinical implications.

**Objectives:** This systematic review aims to evaluate evidence for the role of specific cognitive variables identified by the Ehlers & Clark cognitive model of PTSD, in the development and maintenance of PTSD symptoms following childbirth.

**Results:** Fifteen studies were included. Significant relationships were found between several cognitive variables and PTSD symptoms. However, evidence was inconsistent regarding the strength of these associations. Some variables were investigated within only one study.

**Major conclusions:** There is preliminary evidence that certain variables identified within the Ehlers & Clark cognitive model are associated with PTSD symptoms following childbirth, indicating that cognitive interventions may be appropriate. However, conclusions are based upon limited research evidence. Further robust research is required in order to draw valid conclusions about whether this model is an appropriate theoretical framework for diagnostic and symptomatic PTSD following childbirth.

**Key words:** PTSD; Posttraumatic stress; Childbirth ; Postpartum; Cognitive variables

## Highlights

- Evidence from fifteen studies was reviewed and synthesised
- Several cognitive variables were predictive of PTSD symptoms following childbirth
- Cognitive models of PTSD may be applicable to posttraumatic stress following childbirth
- Further empirical evidence regarding the role of cognitive variables is needed

## Literature overview

There is increasing recognition that a proportion of women experience clinically significant symptoms of posttraumatic stress after childbirth. Research has found that up to 30% of women develop 'partial' clinically significant symptoms on at least one dimension of intrusion, avoidance or hyperarousal (Cigoli, Gilli & Saita, 2006; Czarnocka & Slade, 2000; Soet, Brack & DiIorio, 2003; Maggioni, Margola & Filippi, 2006; Olde, Kleber, van der Hart & Pop, 2006). A smaller proportion of between 1.2 and 9% develop symptoms which fulfil the diagnostic criteria for posttraumatic stress disorder (PTSD) (Alcorn, O'Donovan, Patrick, Creed, & Devilly, 2010; Ayers & Pickering, 2001; Beck, Gable, Sakala, & Declercq, 2011; Creed, Shochet, & Horsfall, 2000; Czarnocka & Slade, 2000; Wijma, Soderquist & Wijma, 1997; Zaers, Waschke & Ehler, 2008). If these figures are applied to the UK statistics for 2011 in which approximately 1,035,000 live births were registered (General Register for Scotland, 2011; Office of National Statistics, 2011), each year approximately 310,600 women may develop clinically significant symptoms and between 12,500 and 93,200 may develop those consistent with diagnostic PTSD. To date, most related research has investigated prevalence and predictors of diagnostic and symptomatic posttraumatic stress following childbirth with much of it lacking a theoretical basis. Some researchers have questioned whether diagnostic or symptomatic posttraumatic stress following childbirth is conceptually similar enough to PTSD following objectively traumatic events to be categorised and understood in the same manner (Slade, 2006; Ayers, Joseph, McKenzie-McHarg, Slade, & Wijma, 2008). There is a need to establish whether current theoretical models of PTSD are applicable to the development and maintenance of posttraumatic stress following childbirth because there are significant clinical implications upon the development and delivery of effective intervention. In addition, it is important to minimise the potential adverse consequences including depressed mood (Alcorn et al., 2010; Czarnocka & Slade, 2000) and disruption to the couple and developing mother-infant

relationship (Davies, Slade, Wright, & Stewart 2008; McDonald, Slade, Spiby & Iles, 2011; Parfitt & Ayers, 2009).

There are six categories for PTSD diagnostic criteria within the Diagnostic and Statistical Manual of Mental Diseases IV (DSM-IV: American Psychiatric Association, 2000). First, the person must have experienced or witnessed a traumatic event involving actual or threatened death, serious injury and responded with intense fear, horror or helplessness (Criterion A). Second, the event is persistently re-experienced via intrusive symptoms, such as intrusive recollections, nightmares or flashbacks (Criterion B). Third, the patient avoids trauma-related stimuli and feels emotionally numb (Criterion C). Fourth, the person has symptoms of increased arousal such as hyper-vigilance, irritability or difficulty sleeping (Criterion D). Fifth, the duration of symptoms (according to Criteria B, C & D) last for more than a month (Criterion E). Lastly, symptoms cause clinically significant distress and impairment in functioning (Criterion F). Type 1 PTSD refers to PTSD that occurs in response to a single traumatic incident. Within this review, diagnostic levels of posttraumatic stress are referred to as PTSD. The term posttraumatic stress is used to refer to clinically significant levels of posttraumatic stress as identified within standardised measures on at least one dimension of intrusion, avoidance or hyperarousal, or for the full measure.

One of the most obvious differences between PTSD or posttraumatic stress after childbirth and PTSD following other events is the nature of the stressor that symptoms relate to. In contrast to events widely considered to be traumatic stressors, childbirth has positive societal connotations and is a normal and predictable event that is usually willingly entered into (Ayers et al., 2008). Research has still to demonstrate whether posttraumatic stress following childbirth follows a similar aetiology, course and duration or has similar effects and response to treatment when compared to PTSD following other events (Ayers et al., 2008).



Leading researchers have cautioned against pathologising signs of emotional distress following childbirth for a number of reasons (Ayers et al., 2008; Slade, 2006). Firstly, symptoms of intrusion and avoidance are considered to be part of a normal adaptive process following a traumatic event. Therefore these would be expected in a proportion of women in response to a perceived traumatic birth experience. Secondly, it has been proposed that postnatal hyperarousal symptoms may not be a result of a traumatic childbirth (Slade, 2006). Sleep difficulties are a normal experience when caring for an infant and irritable mood may be a consequence of this. In addition, symptoms of hyperarousal may constitute an adaptive response to allow for optimal care of the infant (Slade, 2006). Lastly, in addition to assessing a specific trauma response, self-report questionnaires for PTSD measure non-specific distress including items related to mood and anxiety symptoms (Ayers et al., 2008; Slade, 2006). While it may not be helpful to pathologise a possibly adaptive response to a traumatic birth, there is a need for clinically significant posttraumatic stress to be identified and treated during the perinatal period in order to reduce distress and minimise potentially adverse consequences.

Posttraumatic stress following childbirth has been associated with wide variety of factors including trauma history (Ayers, Harris, Sawyer, Parfitt & Ford, 2009 ; Cigoli et al., 2006; Czarnocka & Slade, 2000; Rhodes & Hutchinson, 1994; Soet et al., 2003), pre-existing anxiety and mood disorder (Alcorn et al., 2010; Czarnocka & Slade, 2000; Denis, Parant, & Callahan, 2011), event and obstetric variables (Ayers et al., 2009; Creedy et al., 2000; Fairbrother & Woody, 2007; Ryding, Wijma, & Wijma, 1998; Soderquist, Wijma, Thorbert, & Wijma, 2009) and cognitive appraisals of perceived support and control (Creedy et al., 2000; Czarnocka & Slade, 2000; Maggioni et al., 2006; Soet et al., 2003; Wijma et al., 1997). As noted, few studies have investigated the development or maintenance of posttraumatic stress following childbirth using a theoretical framework. Several cognitive models provide popular and empirically supported conceptualisations of PTSD including

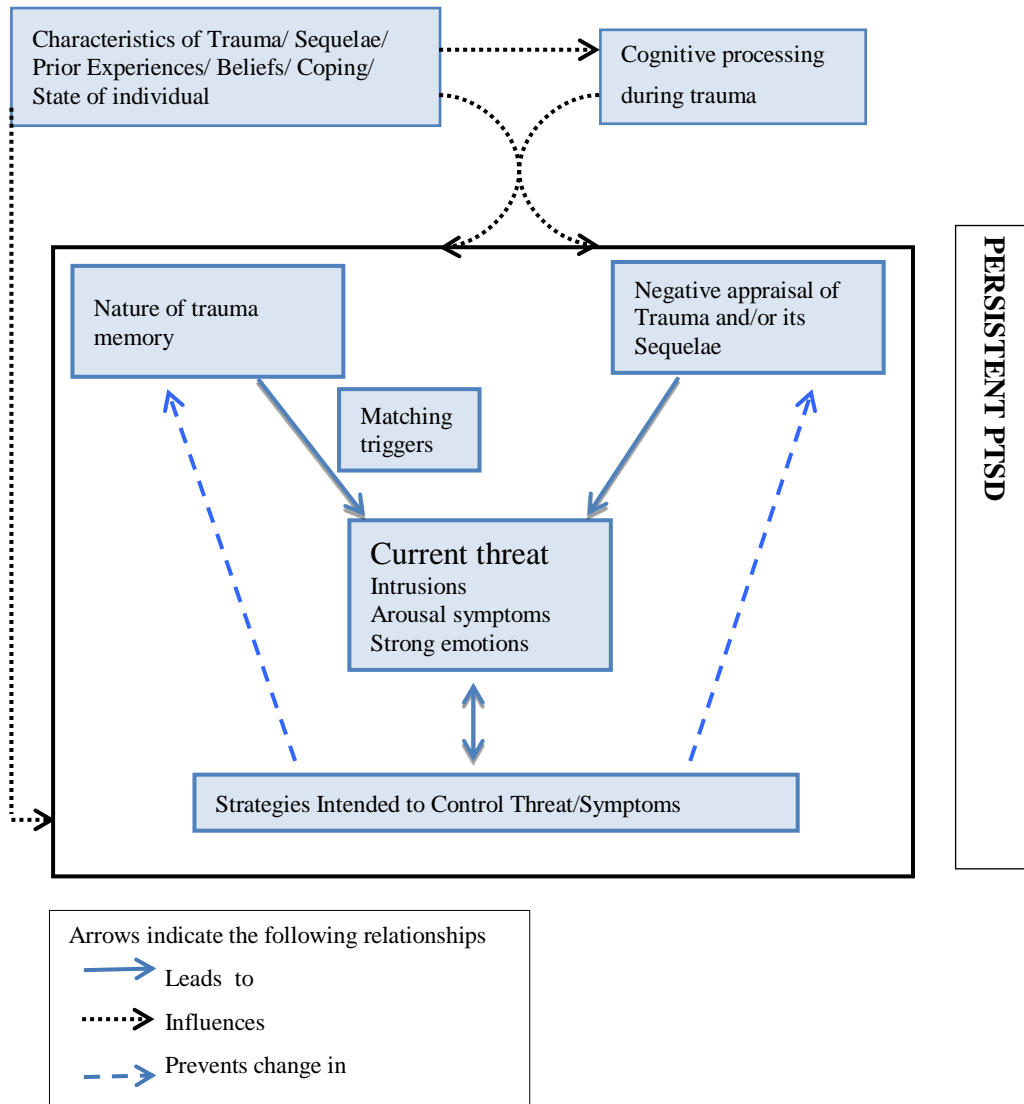
dual representation theory (Brewin, Dalgleish & Joseph, 1996) and Ehlers & Clark's cognitive model (2000). The latter model is considered to provide one of the most detailed accounts of the maintenance and treatment of Type 1 PTSD (Brewin & Holmes, 2003). It has substantial empirical support (e.g. Clohessy & Ehlers, 1999; Ehling, Ehlers & Glucksman, 2006; 2008). Several studies have investigated this model or key cognitive variables within it in relation to posttraumatic stress following childbirth (e.g. Briddon, Slade, Isaac, & Wrench, 2011; Ford, Ayers, & Bradley, 2010). In addition, this model has been used in training workshops to conceptualise PTSD in the perinatal period (British Association for Behavioural & Cognitive Psychotherapies, 2012). The model is described below.

### **A cognitive model of persistent PTSD**

The Ehlers & Clark (2000) cognitive model of PTSD proposes that persistent PTSD occurs only if individuals process the traumatic event and/or its sequelae in a way that produces a sense of current threat. Two key processes are proposed to lead to this: individual differences in the appraisal of the trauma and/or its sequelae and individual differences in the nature of the memory for the event and its link to other autobiographical memories.

Several cognitive variables are proposed to be involved in the development and maintenance of posttraumatic stress. An individual's prior beliefs and coping and cognitive processing during the trauma are posited to activate the development of traumatic stress symptoms. The nature of trauma memory, negative appraisals of the trauma and its sequelae and strategies intended to control threat and/ or symptoms, are proposed as maintenance factors. Within this model, the relationship between individual vulnerabilities, trauma characteristics and symptoms is mediated by negative appraisals. The model is presented schematically in Figure 1 (Ehlers & Clark, 2000).

**Figure 1.** Ehlers & Clark cognitive model of PTSD (Ehlers & Clark, 2000)



Previous systematic reviews relating to posttraumatic stress following childbirth have focused upon prevalence rates and risk factors in its development (Olde, van der Hart, Kleber, & van Son, 2006), management and treatment (Lapp, Agbokou, Peretti, & Ferreri, 2010) or both (Ayers, 2004). This systematic review aims to evaluate and synthesise research evidence for the role of specific cognitive variables identified within the Ehlers & Clark cognitive model in the development and maintenance of posttraumatic stress following childbirth. It will examine evidence for associations between posttraumatic stress and the following variables within samples of women within 12 months postpartum: prior beliefs and coping; cognitive processing during trauma; negative appraisal of trauma and its

sequelae; nature of trauma memory; and strategies to control threat and/or symptoms. The applicability of the full model to posttraumatic stress following childbirth will also be considered.

## **Methods**

### **Inclusion and exclusion criteria**

Within this review, inclusion and exclusion criteria for studies were based upon the PICOS framework (population; intervention; comparators; outcomes; study design) outlined in the Centre for Reviews and Dissemination guidelines (CRD, 2008). There were four relevant criteria: population; comparators; outcomes; and study design.

### ***Population***

Participants of included studies were women within the first postnatal year, including those recruited during pregnancy. They were required to have completed at least one assessment of posttraumatic stress in the first postnatal year. Samples of women who experienced live births via all delivery modes and terms were included. Studies were excluded if samples were formed exclusively of women who had experienced stillbirth, miscarriage or termination.

### ***Comparators***

Within this study comparators were defined as the cognitive variables for which associations with posttraumatic stress were reported. Studies were included if they reported associations between posttraumatic stress and at least one of the following variables: prior beliefs; prior coping style; cognitive processing during trauma; nature of trauma memory; cognitive appraisals of birth or sequelae; and post-birth coping strategies intended to control threat/symptoms.

Studies which were exclusively qualitative were excluded. Qualitative findings were not included in the review for the comparator 'appraisal of birth and sequelae'. However, where studies included a qualitative comparator within the context of relevant quantitative measures, relevant findings were reported. For the comparators pre-existing beliefs and

coping, cognitions or coping specific to childbirth such as fear of childbirth were not included in the review. For the comparator 'appraisal of birth', studies which utilised measures which assessed a specific aspect of birth appraisal such as support, control or pain were excluded. Similarly, studies which assessed appraisal of the birth via a single item response without inclusion of other relevant comparators were excluded (including perception of the birth as traumatic within a PTSD outcome measures). Only studies which utilised measures that assessed multiple aspects of the birth experience were included. However, if the findings reported for individual aspects of the measure (e.g. perceptions of pain or control) as opposed to a general appraisal of birth then the study was not included.

### ***Outcomes***

Symptoms of posttraumatic stress or diagnostic PTSD were the primary outcomes of interest. Studies which focused exclusively on postpartum depression were excluded. Studies which utilised standardised self-report PTSD instruments were included. Studies which used clinician-rated diagnosis were sought but it was anticipated that these would be limited.

### ***Study design***

Studies were eligible for inclusion if they were of prospective, longitudinal or cross-sectional study designs. Clinical case-series and case reports were excluded due to a high risk of bias. Previous systematic reviews, literature reviews, unpublished dissertations, book chapters and descriptive studies with no quantifiable outcomes were also excluded. Articles were excluded if their main aim was to describe the validity or reliability of the measure.

## **Search strategy and selection of studies**

### ***Search stage 1: preliminary searches***

An initial search was conducted in March 2012 using the following databases: OVID electronic databases Medline (1948- 2012) and Embase (1980-2012); EBSCO host databases PsychINFO and Cumulative Index to Nursing and Allied Health Literature (CINAHL);

Midwives Information and Resource Service (MIDIRS); and Published International Literature of Traumatic Stress (PILOTS). Search terms were identified via key words of relevant published research. These were mapped onto subject headings within in each database and all relevant terms were exploded. This resulted in a slight variation in the subject headings utilised across different databases. The following terms were combined to identify relevant studies: *posttraumatic stress disorder* or *adjustment disorders* or *adjustment*; and *labor* or *delivery* or *childbirth* or *birth* or *postpartum*; and *cognition* or *memory* or *coping* or *dissociation* or *avoidance* or *risk factors* or *psychological adaptation* or *predisposition*. The initial searches resulted in the identification of over 1500 studies, many of which were irrelevant or duplicated across databases. This outcome was out with the scope of the current review. Therefore a final search strategy was finalised and conducted as follows.

#### **Search stage 2: Primary database search**

The final search was conducted using the OVID electronic database Medline and EBSCO host databases and PsychINFO up to week 18 of 2012. The following terms were combined to identify relevant studies: *posttraumatic stress disorder* or *adjustment disorders* or *adjustment*; and *labor* or *delivery* or *birth* or *postpartum*; and *cognition* or *memory* or *coping* or *dissociation* or *avoidance* or *risk factors* or *psychological adaptation* or *predisposition*. Titles and abstracts of the resulting articles were screened for relevance to the review. Where the article was clearly or potentially related then the full text article was retrieved. Studies were selected in accordance with the inclusion and exclusion criteria reported above. In addition, articles were excluded if full text was not available in the English language.

#### **Search stage 3: Reference lists & web of science**

The reference lists of articles which met inclusion criteria and identified review articles were screened to identify any additional potentially relevant articles. In addition, the citations of

articles that met inclusion criteria and included measures of birth appraisals were entered into Web of Science to identify any further relevant studies.

### **Data extraction**

The following information was extracted from studies: author, country and design; cognitive variable of interest; assessment times; sample size and characteristics; relevant measures; method of analysis of relevant variables and relevant findings. Where odds ratios were reported, the guidelines of Wuensch (2009) were used to give an approximate indication of the equivalent effect size to enable comparison (O.R.  $\leq 1.49$  as small; O.R. = 3.45 as medium; and, O.R. = 9 as large). Where indirect effect sizes were unreported but direct sizes were given, indirect effects were calculated by multiplying the two direct effect sizes between the predictor to mediator, and mediator to outcome variables.

### **Assessment of methodological quality**

Completion of a methodology checklist is not ordinarily required for review of studies where no comparison group has been used (Scottish Intercollegiate Guidelines Network, 2005). However, to facilitate the assessment of evidence for the purposes of this review, methodological quality assessment criteria were developed (detailed in Table 1).



**Table 1:** Checklist for assessment of methodological quality

<b>Quality criteria</b>	<b>Description</b>	<b>Categorisation</b>
<b>Power calculation</b>	Power calculation is reported and sufficient power is achieved	Well covered
	Power calculation is not reported but study is likely to have sufficient power due to large sample size	Adequately addressed
	Power calculation is reported and study lacks statistical power at least at one time point	Limited
	Power calculation is not reported and study may lack statistical power	Poorly addressed
<b>Generalisability</b>	Sample demographic and obstetric characteristics are reported and compared to non-completers (where relevant) and national statistics	Well covered
	Sample demographic and obstetric characteristics reported and compared to either non-completers or national statistics	Adequately addressed
	Demographic and obstetric characteristics reported but comparisons not reported	Poorly addressed
	Limited obstetric and demographic characteristics reported	Not addressed
<b>Baseline assessed</b>	Baseline posttraumatic stress measured in pregnancy	Well covered
	Baseline posttraumatic stress measured early postpartum	Limited
	Baseline posttraumatic stress not assessed	Not addressed
<b>Outcome and predictor measures</b>	All or the majority of primary outcome and predictor measures are evidenced to be both valid and reliable and psychometric values specified by authors	Well covered
	At least 50% of primary outcome and predictor measures evidenced to be both valid and reliable and psychometric values specified by authors.	Adequately addressed
	Less than 50% of primary outcome and predictor measures evidenced to be both valid and reliable and psychometric values specified by authors.	Poorly addressed
<b>Prevalence rates</b>	Descriptive statistics for posttraumatic stress comprehensively reported including: prevalence rates, mean scores, standard deviations	Well covered
	Partially reported descriptive statistics for posttraumatic stress: including prevalence rates	Adequately addressed

	Some descriptive statistics for posttraumatic stress reported but sample prevalence rates not reported	Poorly addressed
	Prevalence rates not reported	Not addressed
<b>Effect sizes reported</b>	Effect sizes clearly reported within article text	Well covered
	Effect size statistics reported within statistical tables but not clearly reported within text	Adequately addressed
	Effect sizes not reported	Not addressed

## **Results**

### **Study inclusion**

The final search strategy identified 142 articles. Articles were excluded based on criteria described in Figure 2. A total of 15 studies met inclusion criteria, one of which was identified from search stage 3: reference lists.

### **General characteristics of reviewed studies**

The general characteristics and key findings of the included studies are displayed in Table 2, presented in alphabetical order. Each study investigated predictor variables for the development of posttraumatic stress following childbirth. Seven studies had a primary aim related to the predictive role of cognitive variables (Briddon et al., 2011; Edworthy, Chasey, & Williams, 2008; Ford et al., 2010; Greco et al., 2005; Olde et al., 2005; Soderquist et al., 2006; Tham, Christensson & Ryding, 2007). One of these (Ford et al., 2010) investigated the Ehlers & Clark's cognitive model using structural equation modelling (SEM) methodology. Within the remaining studies comparator variables were one of several predictors of posttraumatic stress or postnatal adjustment (which included assessment of depressive symptomatology). Two articles reported partial results of wider studies investigating postnatal depression or postnatal adjustment and infant mental health (Lemola, Stadlmayr & Grob, 2007; van Son, Verkerk, van der Hart, Komproe & Pop, 2005).

Studies were mostly conducted within Northern Europe (n=9). Most were of longitudinal or repeated measures design with two or more assessment times (n=11). The remaining three studies were cross-sectional. Sample sizes ranged from 66 to 1640. Where baseline posttraumatic stress or pre-existing cognitive variables were measured, this was generally either in late pregnancy (n=6) or within 72 hours postpartum (n=3). Posttraumatic stress was assessed with a total of seven different questionnaires: the Impact of Events scale (IES: Horowitz, Wilner & Alvarez, 1979); the revised version of this (IES-R: Weiss & Marmar,

1997) and a shortened IES-R; the Post Traumatic Stress Disorder Questionnaire (PTSD-Q: Watson, Juba, Manifold, Kucala & Anderson, 1997) adjusted to remove items for sleep and memory; the PTSD Diagnostic Scale (PDS: Foa, Cashman, Jaycox & Perry, 1997); the Dutch version of the PTSD Symptom-Scale- Self Report Version (PSS-SR; Foa, Riggs, Dancu & Rothbaum, 1993; Dutch version: Anrtz, 1993); the Posttraumatic Stress Checklist for Civilians (PCL-C: Weathers, Litz, Huska, & Keane, 1994); and the Traumatic Events Scale (TES: Wijma et al., 1997). One study used two measures (Briddon et al., 2011). Questionnaires used to measure cognitive and coping variables are outlined within the following section.

Where reported, prevalence rates for diagnostic levels of posttraumatic stress ranged from 0.8%-3% with up to 48 % of participants partially symptomatic. The criteria for significant symptoms of posttraumatic stress varied across studies, defined either as meeting full diagnostic criteria or scoring above a cut off rate for symptom subscales or the total scale of different instruments. Studies used a range of statistical techniques to assess the relationship between predictor and outcome variables including regression analyses or structural equation modelling (SEM) for continuous data, and analysis of variance (ANOVA) and logistic regression for dichotomous data.

**Figure 2:** Flowchart detailing literature search process

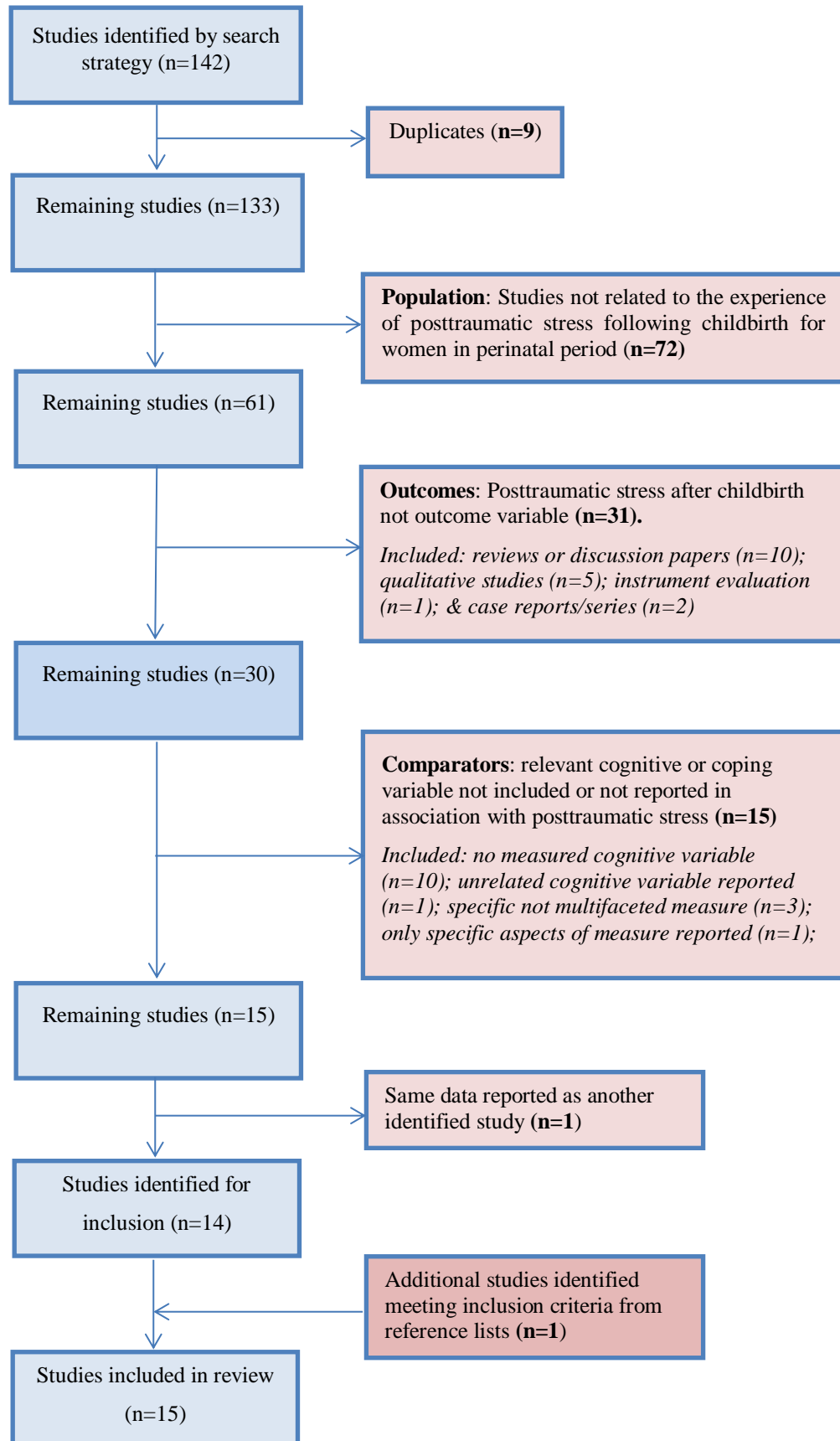


Table 2: Descriptive summary of included studies

<b>Author/ Country/ Design</b>	<b>Cognitive Variable of interest</b>	<b>Assessment times</b>	<b>Sample size&amp; Characteristics</b>	<b>Relevant Measures(DV &amp; IV)&amp; timing</b>	<b>Relevant analysis&amp; if analysed as dichotomous or continuous data</b>	<b>Relevant findings</b>
Briddon et al (2011) / UK/ P- L	Memory Disorganisation;	T1: 72hrs pp T2: 6wks pp	T1: n=122 T2: n=68 Primiparas; low health risk; range of deliveries excluding EIC	IES (T1 & T2); Adjusted PTSDQ (T2); TMQ: Disorganisation subscale (T1); content analysis of birth narrative(T1)	Continuous data; Correlational analysis	Disorganised memory at birth significantly associated with PTS at 6 weeks; disorganised birth narrative within 72 hrs not significantly associated with subsequent memory disorganisation or PTS.
Edworthy et al (2008)/ UK/ P- L	Pre-existing schema; Appraisal of birth	T1:34wks T2:6wks pp	T1: n=121 T2: n=108 Nulliparous; low health risk; range of delivery modes	IES -R (T2); WDEQ A (T1)& B(T2); YSQ-S (T1)	Continuous data; regression analysis	Impaired limits schema (ILS)& negative perceptions of birth (NPB) statistically predictive of PTS; ILS small effect & explained 5% of variance; NPB large effect & explained 24% of variance.
Ford et al (2010)/UK/P-L	Prior beliefs&coping ; Post-traumatic cognitions(PTC)	T1: 36wks T2:3wks pp T3: 3m pp	T1: n =136 T2: n= 125 T3: n = 109 All parities	PDS (T1, 2 & 3); SES (T1);DAS (T1); PTCI (T2);	Continuous data; structural equation modelling (SEM)	Prior beliefs, coping &PTC significantly associated with PTS at T2&3; Effect of prior beliefs & coping fully mediated by PTC; PTC had large effect on PTS at T1 but small effect at T2. Cognitive model explained 23% & 9% of variance at T1&T2
Greco et al (2005)/USA/ C-S	Experiential avoidance (EA)	T1:Between 3-36 months pp	N=66 High health risk (premature infants); all parities	PCL-C (T1); AAQ (T1)	Continuous data; regression analysis	EA partial mediator of preterm stressors upon PTSS; EA statistically predictive of PTSS (medium effect &explained 14% of variance)

Lemola et al (2007)/ Switzerland/ P-L	Appraisal of birth experience	T1: 6wks pp T2: 5m pp	T1: n= 458 T2: n= 374 All parities; Range of delivery modes	IES-R (amended by authors) (T2); SIL-ger (amended by authors) (T1)	Continuous data; regression analysis	Appraisal of birth experience statistically significant predictor of avoidance/intrusion (explained 7.5% of variance of avoidance & 1.6% of hyperarousal).
Lev-Weisel& Daphna-Tekoah (2010) / Israel/P-L	Peritraumatic dissociation	T1: 16-28wks T2: 6-15wks pp	T1: n=1586 T2: n=1003 All parities; range of delivery modes	PDS (T2); PDEQ (T2)	Continuous data; regression analysis	Perinatal dissociation statistically predictive of higher levels of PTS (small effect size)
Olde et al (2005); Netherlands/ P-L	Peritraumatic dissociation	T1=1wk pp T2=3m pp	T1: n=229 T2: n=140 Low health risk	PDEQ (T1); SDQ-P (T1); PSS-SR (Dutch version)(T2)	Continuous data; regression analysis	Psychoform & somataform peritraumatic dissociation significant predictors of PTSS. Small effect of perinatal dissociative reactions upon PTS partially mediated by perinatal emotional reactions.
Soderquist et al (2006)/ Sweden/ P-L	Coping	T1: 16-20wks T2: 32wks T3: 1m pp T4: 4m pp T5: 7m pp T6: 12 m pp	T1: n = 1224 T2: n = 951 T3: n = 908 T4: n = 823 T5: n = 813 T6: n = 763 Low health risk; all parities	TES (T2-6); SCI (T1)	Dichotomous data (Full PTSif met criteria for B, C, &D); odds ratios	Low stress coping not associatedwith increased risk of meeting PTSD criteria BCD at any assessments postpartum
Soet et al (2003)/ USA / P-L	Coping Appraisal of birth	T1: late pregnancy T2: 4wks pp	T1: n=112 T2: n=103	WDEQ- A&B (T1 & T2) ; SOC (T1); TES (T2)	Dichotomous data plus continuous data; regression analysis	High PTS significantly associated with lower coping; Coping not a significant predictor of PTS; Expectation differences a significant predictor of PTS (small effect size $\beta=.25$ )
Stadlmayr et al (2007)/ Switzerland / P-L	Appraisal of birth experience;Peritraumatic Dissociative experiences	T1:48-96hrs pp T2: 1wksp T3: 2wksp T4: 3wksp	T1: n= 251 T2 & T3: not reported T4: n=222 Demographics not collected	IES (T1, 2 & 3) SIL-ger (T1); PDE: BBCI (T1)	Continuous data; regression analysis	PDE statistically predictive of PTS at T3&4 but only accounted for 1.6% of variance, OR= 1.15 Appraisal of birth significantly predictive of PTS at T3 &4, accounting for 5% of variance, OR=1.02

Stramrood et al (2011) / The Netherlands / C-S	Coping	T1: 2-6m pp	n=428 All birth types, including terminations & stillbirths	TES-B (T1); SOC (T1)	Continuous data; regression analyses	Strong negative correlation between PTS symptoms and coping; coping did not moderate relationship between IV's and PTS; Low coping was a significant predictor of PTS (large effect size)
Tham et al (2007) / Sweden /P-L	Coping	T1: 2days pp T2: 3m pp	T1 = 129 T2 = 122 EmCS; low health risk (mother); full term.	IES (T2) SOC (T1)	Dichotomous (IES score $\geq 20$ )& continuous data; regression analyses	Low SOC statistical predictor for PTS (IES scores $\geq 20$ ). O.R.=4.2
Van Son et al (2005)/ The Netherlands/ P-L	Perinatal dissociation	T1: 25wks (screen) T2:32wks T3:3m pp T4: 6m pp T5: 12m pp	T1-T5: n=248 (data presented in study) Nulliparous & multiparous; All delivery modes;	IES (dutch version) (T3- 5); PDEQ (dutch version) (T3)	Continuous data; Structural Equation Modelling	Perinatal dissociation associated with PTS at all times (either directly or indirectly). Small direct predictive relationship at 3 & 12 m. Indirect relationship at 6 months, via traumatic stress at 3 months.
Wijma (1997)/Sweden/ C-S	Cognitive appraisal of birth	T1: Within 12m pp	N=1640; Primiparous& multiparous; all delivery types	WDEQ (B) (T1); TES (T1)	Dichotomous data: ANOVA	Negative appraisal of delivery was significantly associated with a PTSD profile.
Zaers et al., (2007)/ Switzerland/ P-L	Appraisal of birth	T1:32-40wks; T2:1-3d pp T3: 6wkspp ; T4: 6m pp	T1=60; T2=47 T3=50;T4=47 Nulliparous & multiparous; all delivery modes	PDS (T3&4); Adjusted SILger (T2)	Continuous data; regression analyses	Appraisal of birth experience explained 2.5% of variance of PTS at 6 months, with small effect size.

KEY: AAQ : Acceptance & Action Questionnaire (Hayes et al., 2004); adjusted PTSDQ: Adjusted Posttraumatic Stress Disorder Questionnaire (Watson et al., 1991); CNT: Childbirth narrative task (Halligan, Michael, Clark & Ehlers, 2003); DAS: Dysfunctional attitudes Scale (Weissman, 1979); IES: Impact of Events Scale (Horowitz et al., 1979); IES-R: Impact of events scale (Revised) (Weiss & Marmar, 1996); PDE-BBCI : Peritraumatic Dissociative Experiences, Berne-Basle Childbirth Inventory (unpublished); PDEQ: Peritraumatic Dissociative Experiences Questionnaire (Marmar et al., 1977); TMQ: Trauma Memory Questionnaire (Halligan et al., 2002, 2003); PTCI: Post traumatic cognitions inventory (Foa, Ehlers, Clark, Tolio & Orsillo, 1999); PCL-C: Posttraumatic stress checklist for civilians (Weathers et al, 1994); PSS-SR: PTSD Symptom-Scale-Self Report version (Foa et



al., 1993; Dutch version: Arntz, 1993); PDS: PTSD Diagnostic Scale (Foa et al, 1997); SIL-ger : Salmon's Item List (German version) (Salmon, Miller & Drew.,1990); SES: Self efficacy scale (Sherer et al, 1982); SOC: Sense of Coherence Scale (Antonovsky, 1993); SDQ-P: Somataform Dissociation Questionnaire-Peritraumatic (Nijenhuis& Van der Hart, 1998); SCI: Stress coping Index (Ryding et al 1998); TES: Traumatic Event Scale (Wijma et al., 1997); WDEQ A& B: Wijma Delivery Expectancy Questionnaire (Wijma, Wijma & Zar., 1997); YSQ-S: Young Schema Questionnaire (short form) (Schmidt, Joiner, Young, & Telch, 1995)

Table 3 Quality assessment of included studies

<b>Study</b>	<b>Power calculation</b>	<b>Generalisability</b>	<b>PTS baseline assessed</b>	<b>Use of valid and reliable measures</b>	<b>PTS descriptive stats</b>	<b>Effect size</b>
Briddon et al (2011)	Poorly addressed	Adequately addressed	Adequately addressed	Poorly addressed	Poorly addressed	Adequately addressed
Edworthy et al (2008)	Well covered	Adequately addressed	Not addressed	Well covered	Well covered	Adequately addressed
Ford et al (2010)	Limited	Adequately addressed	Well covered	Adequately addressed	Well covered	Well covered
Greco et al (2005)	Poorly addressed	Adequately addressed	Not addressed	Adequately addressed	Not addressed	Adequately addressed
Lemola et al (2007)	Adequately addressed	Well covered	Not addressed	Poorly addressed	Well covered	Adequately addressed
Lev Weisel & Daphna-Tekoah (2010)	Adequately addressed	Adequately addressed	Well covered	Well covered	Poorly addressed	Well covered
Olde et al (2005)	Adequately addressed	Well covered	Adequately addressed	Adequately addressed	Well covered	Well covered
Soderquist et al (2006)	Adequately addressed	Adequately addressed	Well covered	Poorly addressed	Well covered	Adequately addressed
Soet et al (2003)	Well covered	Adequately addressed	Not addressed	Poorly addressed	Well covered	Adequately addressed
Stadlmayr et al (2007)	Adequately addressed	Adequately addressed	Not addressed	Poorly addressed	Adequately addressed	Adequately addressed
Stramrood et al (2011)	Adequately addressed	Well covered	Not addressed	Poorly addressed	Well covered	Adequately addressed
Tham et al (2007)	Adequately addressed	Adequately addressed	Not addressed	Adequately addressed	Well covered	Adequately addressed
Van Son et al (2005)	Adequately addressed	Poorly addressed	Not addressed	Well covered	Well covered	Adequately addressed
Wijma (1997)	Well covered	Adequately addressed	Not addressed	Adequately addressed	Well covered	Not addressed
Zaers et al (2008)	Poorly addressed	Poorly addressed	Not addressed	Well covered	Well covered	Adequately addressed

## **Associations between cognitive variables and posttraumatic stress**

Cognitive variables were synthesised into temporal categories. Seven studies investigated associations between predisposing variables in the development of posttraumatic stress following childbirth. Four investigated the role of precipitating variables. Nine studies investigated associations between postnatal maintaining variables and posttraumatic stress. These are detailed in the following sections.

### ***Predisposing factors***

#### ***Beliefs***

Two studies examined associations between pre-existing schema and posttraumatic stress following childbirth (Edworthy et al., 2008; Ford et al., 2010). Pre-existing beliefs were measured by the Young Schema Questionnaire- short form (YSQ-S: Schmidt, Joiner, Young, Telch., 1995) and Dysfunctional Attitudes Scale (DAS: Weissman, 1979). Based on the results of these studies there was preliminary evidence that pre-existing schema may be predictive of posttraumatic stress symptomatology, though the extent of this is not clear.

In the first study the YSQ-S Impaired Limits schema measured in late pregnancy had a small direct effect upon posttraumatic stress at 6 weeks postpartum (Edworthy et al., 2008). No other schemas were significant predictors. The Impaired Limits schema relates to positive beliefs about self in relation to others (Young, 1999). Individuals with this schema are thought to have difficulty setting realistic personal goals (Young, 1999). It is possible that if individuals have this schema, it could be triggered if the reality of childbirth does not correspond to their high expectations of self in relation to childbirth (Edworthy et al., 2008). Janoff-Bulman's (1985) proposal that vulnerability to posttraumatic stress is related to having positive pre-trauma beliefs that are prone to 'shattering' in face of negatively appraised experiences could explain why this schema may be influential in the development of posttraumatic stress following childbirth, as opposed to alternative schemas. This is also

consistent with the proposal that incongruence between pre-existing beliefs and trauma experiences may lead to posttraumatic stress (Power & Dalgleish, 1996). Of note, only a small proportion of the variance of posttraumatic stress (4%) was explained by this schema. In addition, there was no baseline assessment of posttraumatic stress which makes it hard to ascertain whether symptoms developed in relation to childbirth. Therefore caution is recommended in interpreting these findings. Aside from the lack of baseline assessment of posttraumatic stress, this study was of a good methodological quality.

Ford et al (2010) found a predictive relationship between the DAS and posttraumatic stress. This was an indirect association, fully mediated by negative appraisal of birth and sequelae. However, it was only significantly predictive at 3 weeks and was calculated to be of small magnitude. At 3 months the association reduced to a negligible size. This resulted from a reduction in the relationship magnitude between the mediator (negative appraisal of trauma and sequelae) and outcome variable (posttraumatic stress), rather than a change in the relationship between pre-existing beliefs and the mediator. This study was generally of high methodological quality and used SEM, a powerful statistical technique. Unfortunately it may not have achieved statistical power at 3 months, limiting the validity of results at this time point. The proportion of variance which pre-existing beliefs accounted for at 3 weeks was not reported in this analysis.

### *Coping style*

Five studies reported on the relationship between pre-existing coping style and posttraumatic stress following childbirth (Ford et al., 2010; Soderquist et al., 2006; Soet et al., 2003; Stramrood et al., 2011, Tham et al., 2007). Coping style was measured using the Sense of Coherence Scale (short or long version) (SOC: Antonovsky, 1993), the Stress Coping Index (SCI: Ryding et al, 1998) and the Self Efficacy Scale (SES: Sherer et al., 1982). There was inconsistent support for the role of pre-existing coping style in the development of

posttraumatic stress. Where significant associations were found, it was not clear what proportion of variance was accounted for by coping style.

The results of two studies (Soderquist et al., 2006; Soet et al., 2003) indicated pre-existing coping may not be predictive of posttraumatic stress. Soderquist et al (2006) found that low stress coping was not significantly associated with having posttraumatic stress at least once in 1-11 months postpartum. In Soet et al (2003) low stress coping was not a statistical predictor within regression analysis.

The three remaining studies (Ford et al, 2010; Stramrood et al., 2011; Tham et al., 2007) showed that coping style may be predictive. In the two latter studies it was a significant predictor within regression analysis. These studies reported a large effect size (Stramrood et al., 2011) and an odds ratio of 4.2 (Tham et al., 2007) indicating that this relationship may be of medium-large magnitude. However due to the method of analysis, neither study reported the proportion of variance independently predicted by coping style. The findings of Ford et al., (2010) indicate that its predictive value may reduce over time. Here, an indirect relationship between coping style and posttraumatic stress fully mediated by negative appraisal of birth and sequelae was found. This indirect association was significant at 3 weeks but not at 3 months when it reduced from a small to negligible magnitude. This resulted from a reduction from medium to small effect size between the predictor variable (coping style) and mediating variable (appraisal of birth and sequelae), and between the mediator and outcome variable (posttraumatic stress).

Although these studies were generally of good quality, there was some variability. Only three studies (Ford et al., 2010; Soet et al., 2003; Soderquist et al., 2006) assessed coping style prior to birth and only two (Ford et al., 2010 and Soderquist et al., 2006) assessed baseline posttraumatic stress. This limits conclusions about the genuine predictability of coping style and whether symptoms were related to childbirth. It was not clear whether the

coping measure used within Soderquist et al (2006) was valid and reliable because this was not reported and the measure could not be traced via the referenced article. In addition, this study analysed dichotomous data and participants were assigned to experiencing posttraumatic stress or not. Here posttraumatic stress was defined as meeting symptom criteria for B, C and D (that is, reporting at least one symptom of intrusion, three of avoidance and two of hyperarousal). This classification for posttraumatic stress could be considered stricter than other studies which were analysed according to total score. This may partially account for results. It is also possible that variations in assessment times may account for inconsistent findings. However, there was no clear relationship between timing of outcome measure and the role of pre-existing coping styles across different studies.

#### *Summary of predisposing factors*

In summary, there is some preliminary evidence that pre-existing beliefs and coping styles may predispose individuals to the development of posttraumatic stress following childbirth. However, it is not clear how important these are in predicting symptoms of posttraumatic stress particularly in relation to the course of posttraumatic stress.

#### ***Precipitating factors***

##### *Dissociation*

Four studies investigated the precipitating role of peritraumatic dissociation in posttraumatic stress following childbirth (Lev Weisel & Daphna-Tekoah, 2010; Olde et al., 2005; Stadlmayr et al., 2007; Van Son et al., 2005). This was measured by the Peritraumatic Dissociative Experiences Questionnaire (PDEQ: Marmar, Weiss & Metzler, 1977), the Somatoform Dissociation Questionnaire-Peritraumatic (SDQ-P: Nijenhuis & Van der Hart, 1998) and the Peritraumatic Dissociative Experiences scale of the Berne-Basle Childbirth Inventory (BBCI; unpublished).

All studies consistently found peritraumatic dissociation significantly predicted symptoms. There were some interesting findings within these studies. Van Son et al., (2005) found that a small direct association at 3 and 12 months postpartum, but not at 6 months. Olde et al., (2005) found a small effect which was partially mediated by perinatal emotional reactions. The proportion of variance explained by perinatal dissociation was only reported in two studies (Olde et al, 2005; Stadlmayr et al, 2007), at 10% and 1.6% respectively. This variation could partially be attributed to the un-validated 6 item dissociation subscale utilised in the latter study. While three studies demonstrated temporal predictability (Olde et al., 2005; Stadlmayr et al, 2007; Van Son et al.,2005) the remaining assessed the two variables at the same time point. Baseline posttraumatic stress in pregnancy was only controlled for in one study (Lev Weisel& Daphna-Tekoah, 2010). A further caveat is that with the exception of Stadlmayr et al (2007), dissociation was reported retrospectively at either 1, 6 or 12 weeks postpartum. This may have affected the accuracy of participant reports. In addition, the SDQ-P used by Olde et al. (2005) had unacceptable reliability levels ( $\alpha < .7$ ). However this study used two measures for peritraumatic dissociation. Despite these factors three studies (Lev Weisel & Daphna-Tekoah, 2010; Olde et al., 2005; Van Son et al., 2005) were generally of a high methodological quality and used either multiple regression or SEM for analysis. The remaining study was of poorer quality. Of note, Britton et al (2011) included assessment of cognitive processing during birth but this study did not report associations with posttraumatic stress.

#### *Summary of precipitating factors*

There is consistent evidence from four studies that peritraumatic dissociation during birth may be associated with the development of posttraumatic stress following childbirth.

## ***Maintaining factors***

### ***Appraisal of birth***

Five studies investigated associations between appraisals of birth experience and posttraumatic stress. Appraisal of birth experience was measured by the Wijma Delivery Experience Questionnaire – version B (WDEQ-B: .Wijma, Wijma & Zar, 1998) and the Salmon's Item List (German version) (SIL-ger; Salmon, Miller & Drew, 1990) or an adaptation of this.

The studies consistently found that negative appraisals of birth experience were either statistically predictive of (Edworthy et al., 2008; Lemola et al., 2007; Stadlmayr et al., 2007; Zaers et al., 2008) or associated with (Wijma, 1997) symptoms of posttraumatic stress. However, there was variation in effect sizes and the proportion of variance of posttraumatic stress that appraisal of birth explained. Three studies reported a small effect size and a relatively small proportion of variance of between 1.6 and 7.5% (Lemola et al., 2007; Stadlmyr et al., 2007; Zaers et al., 2008). In contrast, Edworthy et al (2008) found a large effect size and 24% of the variance accounted for. The three studies in which appraisal of birth had a less predictive role were of poorer methodological quality than Edworthy et al (2008). Of particular relevance, one utilised adapted versions of predictor and outcome measures, compromising validity (Lemola et al., 2007) and another had a small sample size which may not have achieved statistical power (Zaers et al., 2008). In addition to the above findings, differences between expectations of birth experience and appraisal of actual birth experience were found to be significant predictor of posttraumatic stress (Soet et al., 2003).

Although there was variation in the methodological quality of studies, results provide consistent support that negative appraisal of birth experience is associated with posttraumatic stress up to 12 months postpartum. There are several caveats. Causality cannot be assumed, particularly as none of these studies assessed baseline posttraumatic stress. Perhaps more



significantly, the constructs assessed by these measures were not designed to assess appraisals of trauma and sequelae as identified within the Ehlers & Clark model.

#### *Negative appraisal of trauma and sequelae*

One study (Ford et al., 2010) investigated associations between negative appraisal of the trauma and sequelae, as defined within the cognitive model, using the posttraumatic cognitions inventory (PTCI: Foa et al., 1999). This study provided preliminary evidence that this may be a significant predictor of posttraumatic stress at 3 weeks postpartum but less so at 3 months. As proposed within the Ehlers & Clark model, posttraumatic cognitions fully mediated the effect of birth interventions and prior experiences, beliefs and coping upon posttraumatic stress at 3 and 12 weeks postpartum. This variable also partially mediated the effect of social support on posttraumatic stress at 12 weeks. However, the magnitude of the relationship between posttraumatic cognitions and posttraumatic stress reduced substantially from medium at 3 weeks to small at 3 months. In addition, the proportion of variance accounted for by the full cognitive model reduced from 23% to 9%, providing further indication that these cognitive variables are less predictive at 3 months. As noted above, while this study was generally of high methodological quality it may have lacked statistical power at 3 months.

#### *Memory*

The relationship between a specific aspect of trauma memory - memory disorganisation and posttraumatic stress was investigated by one study (Briddon et al., 2011). Trauma memory disorganisation was assessed at 6 weeks using the disorganisation subscale of the Trauma Memory Questionnaire (TMQ: Halligan, Halligan, Clark, & Ehlers, 2002, 2003) and at 72 hours postpartum via content analysis of childbirth narratives, using a manual designed specifically for memory disorganisation (Halligan et al., 2003).

There was partial support that memory disorganisation was associated with posttraumatic stress. Disorganised memory of birth at 6 weeks postpartum was associated with posttraumatic stress at the same time point, with a small and medium sized relationship for the two utilised posttraumatic stress measures. However, temporal relations or causality cannot be assumed as both were assessed at 6 weeks. There was no significant association between organisation of birth narratives within 72 hours postpartum and posttraumatic stress at 6 weeks. Assessment at 6 weeks may be appropriate timing for a maintenance factor, while assessment within 72 hours is not. Further, it is questionable how organised any birth narrative would be at 72 hours. It was not clear whether this study had sufficient power as approximately 50% of the sample dropped out, potentially resulting in a sampling bias. Indeed, there was a significant difference between respondents and non-respondents for cognitive processing scores.

Of note, the assessment of trauma memory disorganisation within this study captured only one aspect of trauma memory. It did not adequately encapsulate the complex and multifarious phenomenon of trauma memory which is proposed to account for persistent PTSD within the Ehlers & Clark model. Trauma memory disorganisation may be related to the elaboration and integration of trauma memory into an individual's autobiographical memory base, which is proposed within the model to account for problematic intentional recall, the 'here and now' quality of intrusions, the absence of links to subsequent information and the easy triggering of memories by physically similar cues. However, assessment of trauma memory disorganisation does not sufficiently assess other aspects of trauma memory such as stimulus-stimulus (S-S) and stimulus-response (S-R) associative learning, which are proposed to be responsible for triggering event memories and involuntary emotional responses. Neither does it capture assessment of strong perceptual priming for stimuli temporally associated with the traumatic event, which is proposed to be significant in triggering memory intrusions.

### *Strategies to control threat*

One study investigated the association between cognitive strategies used to control threat or symptoms and posttraumatic stress (Greco et al., 2005). Here, the role of experiential avoidance, measured by the Acceptance & Action Questionnaire (AAQ: Hayes et al., 2004) was investigated within the context of psychological adjustment following premature birth. Experiential avoidance mediated the effect of preterm stressors upon posttraumatic stress and accounted for 14% of its variance, providing support for its role as a potential maintaining factor. There are several caveats to this study. It had a small sample size and may not have achieved sufficient power. The cross-sectional design made it hard to establish whether experiential avoidance was a pre-existing cognitive style or a strategy to control threat or stress. In addition, the sample data was collected up to 36 months postnatally with mothers who had experienced preterm childbirth, making it hard to attribute symptoms directly to childbirth.

### *Summary for maintaining factors*

In summary, there is evidence from six studies that appraisal of birth is associated with posttraumatic stress. However, only one study utilised a questionnaire specifically designed to measure the role of posttraumatic cognitions and sequelae, as defined within the Ehlers & Clark cognitive model. This indicated that negative appraisal of birth and its sequelae may maintain posttraumatic stress within the first few weeks postpartum but less so at 3 months. There was preliminary support that a disorganised trauma memory may maintain symptoms of traumatic stress. However, this study captured only one aspect of trauma memory proposed within the Ehlers & Clark model to be significant in persistent PTSD. In addition, this was found in the context of potential sample bias. Similarly, there was some evidence that experiential avoidance may maintain symptoms after a premature childbirth but this study had several methodological limitations. Therefore, while there is preliminary evidence that negative appraisal of birth and sequelae, trauma memory and experiential avoidance

may be maintenance factors it is hard to draw definite conclusions with only one study investigating each predictor variable.

### **Methodological considerations of the studies**

The review findings should be interpreted within the context of methodological considerations. Whilst the majority of studies did not report upon statistical power, most appeared to be adequately powered with acceptable to large sample sizes. However, for three studies with smaller samples it was not clear whether they met statistical power at recruitment (Greco et al., 2005) or at follow up (Briddon et al., 2011; Ford et al., 2008). This limits the validity of findings.

Several studies found differences between respondents and non-respondents either demographically in terms of age, race, education and marital status or related to mental health outcomes during pregnancy, which may indicate biased sampling (Briddon et al., 2011; Lev-Weisel & Daphna-Tekoah., 2010; Soderquist et al., 2006; Soet et al., 2003). This may have particularly been the case in three studies where a high proportion of the sample dropped out and there were differences in cognitive processing during birth (Briddon et al., 2011) and higher levels of posttraumatic stress and depression during pregnancy (Lev-Weisel & Daphna-Tekoah., 2010; Soderquist et al., 2006). With the exception of two studies (Stadlyamr et al., 2007; Van Son et al., 2005) all reported differences between respondents and non-respondents thus allowing potential bias to be recognised. However only three (Lemola et al., 2007; Olde et al., 2005; Stramrood et al., 2011) compared the sample with national statistics, making it hard to generalise results from the other studies. One study did not record sample characteristics (Stadlyamr et al., 2007). In addition, studies of cross sectional design may have been subject to a self-selection bias.

Only three studies assessed posttraumatic stress during pregnancy to control for prior symptoms of traumatic stress (Ford et al., 2010; Lev-Weisel & Daphna-Tekoah, 2010;

Soderquist et al., 2006). For the remaining studies the symptoms of posttraumatic stress may not have developed as a direct consequence of childbirth. While this was mostly related to study design with no assessment time during pregnancy, this would have been possible in three studies which did include an assessment time in late pregnancy (Edworthy et al., 2008; Soet et al., 2003; Van Son et al., 2005).

Only nine studies reported the use of valid or reliable measures in more than 50% of the relevant predictor and outcome measures. Although all studies used well validated and reliable outcome measures and reported alpha values for their own study, the instrument validity was often unreported. Two studies adapted posttraumatic stress outcome measures. In one, two items were removed for a theoretically plausible reason (Briddon et al., 2011) but for the others, many items were removed to reduce participant burden (Lemola et al., 2007), reducing the validity of the study results. Two studies used shortened (Lemola et al., 2007) or unpublished (Stadlmayr et al., 2007) predictor measures. With the exception of the PTCI, no birth appraisal measures were validated. Aside from reporting alpha values, few studies reported the validity and reliability of predictor instruments. In addition, three studies did not report the prevalence of posttraumatic stress which made it hard to ascertain where relevant conclusions were drawn from

## Discussion

Results of this review provide preliminary evidence that key variables identified within Ehlers & Clark's cognitive model of PTSD may be associated with or predictive of posttraumatic stress following childbirth. However, the amount of evidence varied for different cognitive predictors. Only three variables (coping style, perinatal dissociation, and appraisal of birth) were investigated within three or more studies. Evidence was inconclusive for whether coping style is a predisposing factor. There was consistent support that perinatal dissociation and appraisal of birth may contribute to the development or maintenance of symptoms. It was less clear how predictive these were due to variations in effect sizes and variance proportions.

Although there was preliminary evidence that the remaining variables have a role in the development or maintenance of symptoms, these constructs were investigated in either a single study, or for pre-existing beliefs, two studies. There was support that the individual variables within the model are predictive of posttraumatic stress after childbirth but there was less evidence for the full model. This is largely attributed to the low volume of research investigating the predictive role of several cognitive variables simultaneously. However, from the available research there is limited support that the cognitive variables investigated have a strong predictive relationship with posttraumatic stress. Only two studies found that cognitive variables accounted for more than 20% of the variance of posttraumatic stress (Edworthy et al 2008; Ford et al., 2010). The remaining studies reported substantially less. Either way, a large proportion of variance of posttraumatic stress is unaccounted for. For some studies this may have been attributable to only one or two cognitive variables being investigated. On the other hand, the findings of Ford et al (2010) support that negative appraisal of trauma and its sequelae may mediate the effect of pre-existing beliefs, coping and experiences, as proposed by the model. An interesting finding here was that the predictive value of pre-existing beliefs, coping and negative appraisal of trauma and sequelae

reduced over time. The authors suggested that this may distinguish symptom onset and maintenance. However, negative appraisal of trauma and its sequelae are identified as maintenance factors within the model and findings are not consistent with this. Changes in the predictive value of cognitive variables over time were only investigated in one other study (Van Son et al, 2005). Similarly, this study found changes in the significance of the relationship between perinatal dissociation and posttraumatic stress over time. This is of interest as cognitive processing is considered to be a precipitant variable within the Ehlers & Clark model.

Several methodological factors limited the assessment of whether the theoretical framework of the Ehlers & Clark model is appropriate for conceptualising posttraumatic stress following childbirth. The model accounts for the maintenance of diagnostic PTSD. Within studies assessing posttraumatic stress following childbirth, analysis is usually conducted for symptomatic posttraumatic stress rather than diagnostic levels. As only a small proportion of women develop diagnostic levels of PTSD after childbirth, extremely large sample sizes would be required to conduct a suitably powered study for predictors of diagnostic PTSD. Related to this, reviewed studies were based on a relatively small proportion of participants with clinically significant symptoms. Another issue relates to the timing of assessment measures within studies. Diagnostically, PTSD is considered to exist for a minimum of one month. As previously noted, symptoms equivalent to those measured within standardised measures would be expected in a proportion of women constituting an adaptive response to a traumatic event or in relation to caring for a newly born infant. Several studies assessed and analysed associations between symptoms and cognitive variables within the first six weeks. This may have resulted in inflated associations between posttraumatic stress and cognitive variables. Although most studies did include assessments of posttraumatic stress beyond 3 months only two followed participants up beyond six months, providing limited scope for valid assessment of maintenance factors. Similarly, the timing of cognitive assessment

measures limited conclusions regarding the maintenance factors as several studies assessed cognitive variables at timings inconsistent with the theoretical framework, for example proposed maintaining variables were assessed within 72 hours postpartum. It is acknowledged that the majority of studies did not explicitly aim to assess the role of the cognitive model in posttraumatic stress. While these factors are not necessarily limitations of the individual studies they may influence the interpretability of results.

This is the first systematic review to assess the role of theoretically based cognitive variables in relation to posttraumatic stress following childbirth. The review had a number of limitations. Several electronic databases were not included in the search strategy which could have resulted in relevant articles not being identified. The risk of this was minimised as relevant databases were searched prior to conducting the review, with no additional relevant articles identified. The review may have been subject to cultural bias as it was restricted to research published in English. However, ten studies were conducted in countries where English is not the first language, again minimising this risk. The exclusion of unpublished research may have led to a publication bias, potentially inadvertently increasing the likelihood of finding significant results.

As few studies have investigated the role of cognitive variables in the development and maintenance of posttraumatic stress following childbirth, it was hard to limit their heterogeneity in terms of aims and predictor variables. It was not possible to investigate the predictive role of all variables identified within the Ehlers & Clark model. Several variables were out with the scope of this review including specific birth related beliefs, specific birth appraisal measures, and appraisals of trauma as assessed PTSD outcome measures. In addition, the included construct ‘appraisal of birth’ did not assess appraisal of current threat as defined by the model.



## **Implications for future research and clinical practice**

There is a clear need to gather further evidence regarding whether a cognitive theoretical framework is applicable to the development and maintenance of posttraumatic stress following childbirth. In particular, additional evidence is required for the predictive value of pre-existing beliefs and coping, posttraumatic cognitions, trauma memory and strategies to manage threat. Whilst establishing the role of predisposing and precipitating factors may be helpful from a preventative perspective, finding evidence for maintaining variables would have important treatment implications. In order to gather further evidence of maintaining factors, longitudinal research in which posttraumatic stress is assessed up to 12 months postpartum is required. It may be worthwhile to investigate the applicability of alternative theoretical models of posttraumatic stress to this field, for example metacognitive theory. Future studies should also address methodological limitations of existing research. If possible, posttraumatic stress should be assessed in late pregnancy to control for prior symptoms. Studies should utilise valid and reliable measures and avoid adapting these. To enhance comparability between studies it would be beneficial if a consistent measure was used to assess posttraumatic stress. It would also be practical for studies to recruit larger sample sizes to allow for attrition.

These findings have several implications for clinical practice. Evidence supporting the predictive role of predisposing and precipitating cognitive variables has implications for preventative practice and potential antenatal identification of those at risk of developing symptoms. For example, coping style could be assessed during pregnancy and a preventative approach could be implemented. Similarly dissociative experiences could be screened for post birth. Although evidence for maintaining factors was limited, posttraumatic cognitions, disorganised trauma memory and experiential avoidance were all found to be associated with posttraumatic stress. This indicates that cognitive interventions may be appropriate. However, outcomes should be carefully monitored to establish effectiveness. A recent

systematic review into the management of posttraumatic stress after childbirth found limited evidence for its treatment (Lapp, 2010) however this may be attributable to a paucity of treatment-focused research.

## **Conclusions**

Overall, this review found preliminary support that several key cognitive variables identified within Ehlers' & Clark cognitive model of PTSD are associated with posttraumatic stress following childbirth. However, robust longitudinal research is needed to establish the strength of cognitive predictors. Evidence indicated that cognitive interventions may be appropriate. More research is needed to draw firmer conclusions regarding whether the Ehlers & Clark model may be an applicable theoretical framework for posttraumatic stress after childbirth. To maximise clinical benefits, studies should investigate the role of cognitive variables in symptom maintenance. Alternative theoretical models of posttraumatic stress should be investigated within the context of posttraumatic stress following childbirth, particularly those linked with evidence based intervention approaches.

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## BRIDGING CHAPTER

This section outlines some of the theoretical constructs and psychological models related to this study.

### **Parenting experiences and adult psychological outcomes**

A large body of research provides consistent evidence that childhood parenting experiences constitute risk or resilience to emotional disorders during adulthood (Enns *et al.*, 2002; Joyce, 1984; Lizardi *et al.*, 1995; Mahedy *et al.*, 2011; Narita *et al.*, 2000; Oakley-Brown *et al.*, 1995; Parker *et al.*, 1987; Parker & Hadzi-Pavlovic, 1992). This research has utilised self-report measures such as the Parental Bond Inventory (PBI: Parker *et al.*, 1979) to assess recalled parenting style across two constructs of care/warmth and overprotection/control, which are evidenced to account for much of its variance (Arrindell *et al.*, 1986; Parker *et al.*, 1979). Parental lack of care has most consistently been associated with adult psychopathology (Enns *et al.*, 2002; Mahedy *et al.*, 2011; Narita *et al.*, 2000; Oakley-Browne *et al.*, 1995, with overprotection constituting a risk factor in some studies (Joyce, 1984; Parker & Hadzi-Pavlovic, 1992) and at other times a protective factor (Enns *et al.*, 2002; Mahedy *et al.*, 2011). While associative relationships have been demonstrated within this body of research, it is not possible to ascertain which psychological processes these are attributed to.

A range of psychological theories may be helpful in understanding the association between parenting experiences and later psychological outcomes. These include cognitive theory (Beck, 1979) which proposes an individual's beliefs about themselves, the world and other people are shaped by childhood experiences and social learning theory (Bandura, 1963, 1977) which may account for development of adaptive and maladaptive behaviours. Arguably the most significant is attachment theory (Bowlby, 1969) which proposes that an individual's early experiences of the infant-caregiver relationship has a key influence on

shaping an individual's internal working models, which guide their future relationships and mental health outcomes.

## **Attachment theory and related constructs**

### **Attachment theory**

The formation of the mother to infant attachment relationship and its quality are considered to be of key importance to an infant's wellbeing and development (Bowlby, 1988).

Attachment theory (Bowlby, 1969) proposes that over time and repetition, early caregiver interactions become internalised to form an internal working model: a series of internal representations for the self, the other and interactions, upon which future relationships are based. An individual's working model of attachment representations is considered to remain relatively stable from early childhood onwards. This is supported by empirical research (Fraley, 2002; Hamilton, 2000; Waters *et al.*, 2000). Infant attachment 'styles', assessed in the Strange Situation Paradigm (Ainsworth, 1978) according to attachment related behaviours are classified into four types: insecure avoidant, insecure ambivalent, secure and disorganised. Adult attachment status as measured by the Adult Attachment Interview (AAI: George *et al.*, 1985) is also classified into one of four categories: secure, dismissive, preoccupied or unresolved, with the latter three corresponding to infant classifications of avoidant, ambivalent, and disorganised. Bowlby (1988) proposed attachment insecurity to be a risk factor for clinically significant emotional problems and poor adjustment. This is supported by a large volume of research which indicates attachment status constitutes risk or resilience to emotional disorders across the lifespan (Jinyao *et al.*, 2012; Mikulincer & Shaver, 2012; Shorey & Snyder, 2006).

### **Affect regulation**

Whilst initially conceptualised as an evolutionary infant survival mechanism to promote caregiver proximity, the attachment system is now recognised to be key in the development

of affect regulation during infancy and beyond (Fonagy *et al.*, 1997; 2002). It is generally accepted that an infant learns emotional regulation strategies within the interactional context of the attachment relationship, via the pattern of primary caregiver responses to infant attachment behaviours which are activated by perceived threat. The emotional regulation strategies learned during infancy and early childhood are proposed to continue into adulthood. In this manner, attachment processes are conceptualised as an emotional regulation device across the lifespan, guiding the use of an individual's strategies to manage emotional states when the attachment system is activated by perceived threat (Mikulincer & Shaver, 2007). This is supported by empirical research which has found that emotional regulation strategies differ according to attachment status (Florian *et al.*, 1995; Paley *et al.*, 2002; Seiffge-Krenke & Beyers, 2005).

### **Mentalisation**

Mentalisation, defined as the ability to envisage mental states in self and others, is considered as key in the development of emotional regulation (Fonagy *et al.*, 1997a; 2002). Mentalisation is conceptually similar to Baren-Cohen's (1985) 'theory of mind' which refers to the developmental acquisition of ability to attribute mental states, beliefs, intents, desires to others and to understand that these are distinct from their own (Fonagy, 1997 b). Importantly, a child's capacity to mentalise is considered to develop within the context of their early attachment relationships (Fonagy *et al.*, 1997a; 2002). This acquisition is hypothesised to be related to the development of the representational mapping of emotions, acquired via interactions with the caregiver, particularly responses to affective experiences. Maternal sensitivity is hypothesised to be an important determinant in the development of mentalisation, with high levels of sensitivity proposed to prompt the organisation of affective experiences into clusters of responses, which eventually become labelled as specific emotions (Fonagy *et al.*, 1997). Theoretically, the repetition of sensitive responses to attachment behaviours result in the development of adaptive emotional regulation strategies

such as emotional expression and support seeking (Mikulincer & Shaver, 2007). Conversely, patterns of insensitive, unavailable or rejecting caregiver responses are thought to be associated with the development of maladaptive emotional regulation strategies such as emotional suppression or intensification (Mikulincer & Shaver, 2007). A mother's capacity to hold her child's mental state in mind and understand this is considered to be intrinsic to sensitive parenting (Slade, 2005) and crucial to the child's development of mentalisation and affect regulation (Fonagy 1997; 2002). This can also be defined as maternal reflective functioning (Slade, 2005).

### **Reflective functioning**

Reflective functioning (RF) is defined as the operationalization of the psychological processes underlying the capacity to mentalise (Fonagy, 2002). RF refers to both the capacity to recognise mental states and link these to behaviour in meaningful and accurate ways (Slade, 2005). RF is a measurable construct which can be assessed by applying the RF rating scale (Fonagy *et al.*, 1998) to interview transcripts of the AAI to ascertain the extent to which an individual can understand their own and other's behaviour in terms of mental state, within the context of attachment relationships. Parental reflective functioning, that is the parent's capacity to represent and understand her child's internal experience (Slade, 2005) is also a measurable construct. This is assessed by applying an adapted version of the RF scale to the Parent Development Interview (PDI: Aber *et al.*, 1985), which examines parental representations of their children, themselves as parents and their relationship with their children.

### **The intergenerational transmission of attachment**

The intergenerational transmission of attachment, that is, the predictive nature of maternal attachment representations upon infant attachment status, assessed by the AAI and SSP respectively, is well established by empirical evidence (Benoit & Parker, 1994; Fonagy *et*

*al.*, 1991; Main & Goldwyn, 1995; van Ijzendoorn *et al.*, 1992; van Ijzendoorn, 1995; Zeanah *et al.*, 1995). The previously discussed constructs including maternal sensitivity, maternal reflective functioning and mentalization are considered to have a significant role in attachment transmission and mediate the relationship between adult and infant attachment (Slade, 2005).

### **A note on methodology and construct measurement**

Studies which assess maternal sensitivity and interactional style within the mother-infant relationship commonly utilise an observational methodology, such as video-coded interactions. Maternal attachment representations of their child are ideally assessed through in-depth interviews such as the PDI or the Working Model of Child Interview (WMCI; Zeanah *et al.*, 1993). Similarly, the AAI is considered the gold standard in assessment of adult attachment representations. Though these methods generate rich data, they are resource intensive to administer and analyse. There are also difficulties inherent in the assessment of the constructs of mentalization and reflective function. The former lacks specificity, with a large degree of overlap between theory of mind and reflective function, and the latter is only measureable through analysis of the AAI.

### **Maternal perceptions of the mother-infant relationship**

Maternal cognitions and affect relating to her infant and her emotional bond with the infant are considered to be distinct from her attachment representations of her infant and the infant-mother attachment relationship (Condon & Corkindale, 1998; Taylor *et al.*, 2005). However, there is evidence that new parents and those preparing for parenthood develop mental representations of the infant, themselves as a caregiver and the parent-infant relationship (George & Solomon, 1999; Slade & Cohen, 1996). These are thought to guide caregiving behaviours, expectations, feelings and actions (George & Solomon, 1999). Therefore maternal representations could be considered to influence their cognitions and feelings



towards her infant and the mother-infant relationship, which are likely to influence caregiving behaviour and the developing infant-parent attachment relationship (Condon & Corkindale, 1998; Erickson, 1996). With a view to this, identification of disruptions to the mother-to-infant emotional bond is of clinical significance as this could constitute vulnerability to the developing attachment relationship and infant mental health.

Of note, maternal-infant bonding is poorly defined within literature with a variety of definitions including: the development of the bi-directional relationship directly after birth (Klaus & Kennell, 1972); the mental, emotional and behavioural changes associated with forming a parental tie to a new infant (Feldman *et al.*, 1999); and, the emotional bond experienced by the parent towards the infant (Condon & Corkindale, 1998). This has undoubtedly had negative consequences upon related research, for example by restricting the development of instruments which assess the same construct. A small selection of self-report instruments exist which measure maternal perceptions of the mother-to-infant relationship or bond.

## **Metacognition**

### **The nature of metacognition**

Metacognition is a multifaceted concept, defined as psychological structures, knowledge, events and processes that are involved in the control, modification and interpretation of thinking itself (Wells & Cartwright-Hatton, 2004): or more simply described as ‘cognition about cognition’ (Wells, 2011). This construct has conceptual similarities with theory of mind and therefore mentalization and reflective functioning. Metacognition can be divided into knowledge, experiences, and strategies which are considered to be interdependent (Wells, 1995; 2011). Maladaptation to these is considered to give rise to an unhelpful pattern of thinking which leads to psychological disturbance (Wells, 1995; 2011).

Metacognitive knowledge refers to positive and negative beliefs that individuals have about their own thinking. Positive beliefs concern the benefits of engaging in cognitive activities such as threat-monitoring or rumination, for example 'It is useful to focus attention on threat' or 'If I analyse why I feel this way I'll find the answers'. Negative beliefs concern the negative significance of internal cognitive events, comprising of those related to the uncontrollability of thoughts, for instance 'I have no control over my thoughts' and those concerning the danger, importance or meaning of them, such as 'uncontrollable thoughts are a sign of madness'. These beliefs are a key influence on an individual's responses to negative thoughts, beliefs, symptoms and emotions. Metacognitive experiences refer to appraisals and feelings about current mental status. Negative appraisals of which are considered to increase perceived threat and motivate attempts to control thinking. Metacognitive strategies concern responses made in attempt to control and alter thinking in order to self-regulate emotions and cognitions, for example rumination. These are dependent upon metacognitive beliefs.

### **The Metacognitive model of psychological disorder**

*'Thoughts don't matter but your response to them does.'* (Wells, 2011, p1)

Metacognitive theories of psychological disorder propose that metacognitive processes and aspects of thinking play a significant role in the development and maintenance of psychological disorders (Wells & Matthews, 1994, 1996; Wells & Papageorgiou, 1998). This contrasts to traditional cognitive theories such as Beck's cognitive theory (Beck, 1979) in which the content of thoughts are considered key in the development and maintenance of emotional disorders.

The self-regulatory executive function model (S-REF; Wells & Matthews, 1994, 1996; Wells, 2000) is the basic metacognitive model of psychological disorder. A central principle of the S-REF model is that psychological disorder is associated with a perseverative thinking

style called ‘cognitive-attentional syndrome’ (CAS). The CAS is characterised by worry or rumination, attentional bias to threat stimuli or ‘threat monitoring’ (Wells & Matthews, 1994), unhelpful thought control strategies such as thought suppression, and other behaviours such as cognitive, behavioural and emotional avoidance (Wells, 2011). The model proposes that the CAS results from metacognitive beliefs which control and interpret cognitive and emotional states (Wells, 2011). The S-REF has been adapted for specific psychological disorders resulting in metacognitive models for PTSD and major depression (Wells, 2009).

### **Metacognitive models of PTSD and depression**

Within the metacognitive model of PTSD (Wells, 2000; Wells & Sembi, 2004) metacognition is considered to be more important in the development and maintenance of PTSD than memory features, as proposed by alternative cognitive models (e.g. Brewin *et al.*, 1996; Ehlers & Clark, 2000). Following a traumatic event, symptoms of intrusion, avoidance and hyperarousal symptoms are viewed as part of a normal adaptation process. For some individuals however this adaptive process is prevented by cognitive processes (CAS) which arise in response to the content of metacognitive beliefs, activated by the traumatic event and symptoms. These processes maintain symptoms and prevent a threat-free mode of processing (Wells, 2011).

The metacognitive model of major depressive disorder (MDD) views rumination and worry as voluntary and active coping strategies aimed at dealing with emotion and threatening events (Wells, 2011). These strategies prolong sadness and negative beliefs which intensify and maintain depression. Research consistently demonstrates a high degree of comorbidity between PTSD and depression (Boudreaux *et al.*, 1998; Kessler *et al.*, 1995; Nixon, 2004). Metacognitive theory can provide an account for high levels of comorbidity between PTSD

and depression, as symptoms of intrusion, avoidance and hyperarousal may trigger metacognitive beliefs, experiences and strategies that result in depressed mood.

### **Empirical evidence**

A growing body of research provides empirical support for metacognitive models of psychological disorders by consistently demonstrating a positive relationship between metacognitive beliefs, emotional vulnerability and wide range of psychological disorders (Cartwright-Hatton & Wells, 1997; Janeck *et al.*, 2003; Wells & Carter, 2001; Yilmaz *et al.*, 2011). This includes support for the metacognitive model of depression within clinical (Papageorgiou & Wells, 2001a, 2003) and non-clinical samples (Papageorgiou & Wells, 2001b; Yilmaz *et al.*, 2011) and support for the metacognitive model of posttraumatic stress with non-clinical samples (Bennett & Wells, 2010; Holeva *et al.*, 2001; Roussis & Wells, 2006). To the author's knowledge, the role of metacognition in psychological distress has only been explored in one study within the context of postnatal depression (Hall & Papageorgiou, 2005).

### **Maternal psychopathology and the mother-infant relationship**

The identification and treatment of maternal psychopathology has significant clinical implications not only for the mother but also for the developing attachment relationship and consequently infant mental health. Maternal psychological distress has been associated with disrupted mother-infant interactions and a range of negative developmental outcomes (Caplan *et al.*, 1989; Cogill *et al.*, 1986; Murray & Cooper, 1996; Murray *et al.*, 2009; Stein *et al.*, 1991; 2001). It is widely recognised to increase vulnerability to emotional and behavioural difficulties (Murray & Cooper, 1997).

Childbirth and subsequent caring for an infant would be expected to activate the maternal attachment system, due to the emotional and interpersonal nature of these events. Indeed, childbirth and the postnatal period are recognised to be a particularly vulnerable time for

women to experience psychological distress (Brockington, 2004). The effect of maternal psychopathology upon mother-infant relationship outcomes have mostly been investigated in relation to postnatal depression, for which prevalence rates within meta-analyses are approximately 13 to 19.1% of mothers (Gavin *et al.*, 2005; O-Hara & Swain, 1996). With increasing recognition that a proportion of women develop posttraumatic stress following childbirth a number of studies have investigated the potential consequences of this upon the parent-child or parent-infant relationship. However, due to high rates of comorbidity between depression and posttraumatic stress it is difficult to determine the consequences of the latter.

### **Posttraumatic stress following childbirth**

The findings of qualitative research and case series provide support that posttraumatic stress following childbirth may have adverse consequences for the parent-infant and longer term parent-child relationship. Results include maternal active avoidance of infant, disordered mother-infant attachment (Ballard *et al.*, 1995) and maternal resentment of the infant with subsequent emotional detachment (Allen, 1998). In studies where participants met PTSD diagnostic criteria, parental reports included initial emotional and behavioural rejection of the infant (Ayers *et al.*, 2006), negative perceptions of the child (Nicholls & Ayers, 2007) and longer term negative consequences upon the parent-child relationship (Ayers *et al.*, 2006; Nicholls & Ayers, 2007). Researchers in these studies likened accounts of the parent-child relationships to avoidant-rejecting or overprotective- anxious parental attachment styles. Of note, as depression was not assessed within these studies it is possible that findings were attributable to comorbid depression.

To date, four quantitative studies have investigated the effect of posttraumatic stress following childbirth upon the parent-infant relationship (Ayers *et al.*, 2007; Davies *et al.*, 2008; McDonald *et al.*, 2011; Parfitt & Ayers, 2009). Aside from one study which used a

very basic measure of the parent-baby bond (Ayers *et al.*, 2007), the findings consistently indicate that posttraumatic stress has negative consequences upon mother-infant or mother-child relationship outcomes. However, it is less clear whether posttraumatic stress is independently associated with mother-infant outcomes after controlling for depression. The three studies all included a measure of depression. One found that posttraumatic stress was independently statistically predictive of the mother-baby bond (Parfitt & Ayers, 2009), but the remaining studies found the effect of posttraumatic stress was removed for either most (Davies *et al.*, 2008) or all mother-infant outcomes (McDonald *et al.*, 2011), once depressive symptomatology was accounted for. Methodological considerations such as study design, choice of measure for the mother-infant/ child relationship and timing of assessments may account in part for inconsistencies in these findings. Further research is needed to establish whether posttraumatic stress related to childbirth is independently associated with mother infant relationship outcomes.

There is evidence from premature birth literature that maternal posttraumatic stress may affect mother-infant interactions (Feeley *et al.*, 2005; Forcada-Geux *et al.*, 2011; Singer *et al.*, 2003). However, other issues such as physical separation and infant illness may confound these results. Maternal posttraumatic stress has also been independently associated with infant emotional regulation and maternal reports of infant outcomes (Bosquet-Enlow *et al.*, 2007; Tees *et al.*, 2010).

## **An overview of the current study**

Based upon the discussed theory and research, within this study it is proposed that attachment experiences (1), assessed by a measure of recalled parenting experiences, will be

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(1) This term is used within this study in order to avoid confusion with the variable maternal perceptions of the mother-infant bond. It is considered to be distinct from adult attachment representations.

associated with postnatal symptoms of posttraumatic stress and depression, metacognition and maternal perceptions of the mother-infant bond. Cognitive models of posttraumatic stress (e.g. Ehlers & Clark, 2000) include attachment experiences as a predisposing or protective factor in the development of posttraumatic stress. However, to the author's knowledge this has not previously been investigated in relation to posttraumatic stress following childbirth. As noted, metacognition may provide a link between attachment theory and cognitive models of psychopathology. Therefore, within this study metacognition is proposed to mediate the relationship between attachment and postnatal psychological outcomes. As noted, additional research is required to increase current understanding of the nature of the relationship between posttraumatic stress after childbirth and mother-infant relationship outcomes. In particular, if symptoms have an independent effect from depressive symptoms there are important clinical implications in terms of identification of distress and intervention. Within this study, posttraumatic stress after childbirth is proposed to have an independent direct effect upon maternal perceptions of the mother-infant bond.

## **Hypotheses**

***Hypothesis 1 (a & b):*** Attachment experiences will be associated with postnatal psychological outcomes (depression and posttraumatic stress) (1a) and will have a direct effect on maternal perceptions of the mother-infant bond (1b).

***Hypothesis 2:*** Metacognition will mediate the relationship between attachment experiences and postnatal psychological outcomes.

***Hypothesis 3:*** Postnatal symptoms posttraumatic stress will have a direct effect on maternal perceptions of the mother-infant bond, independent of the effect of depression.

## **Assumptions**

This study made two assumptions which were not directly investigated.

***Assumption 1:*** Postnatal symptoms of depression will have a direct effect on maternal perceptions of the mother infant bond.

***Assumption 2:*** Symptoms of posttraumatic stress will be associated with depression.



## **METHODOLOGY CHAPTER**

### **Design**

An internet-based cross-sectional questionnaire design was employed to examine predicted relationships between self-report measures of posttraumatic stress, postnatal depression, attachment experiences, meta-cognition and maternal perceptions of the mother-infant bond in an analogue sample of women with infants aged 12 months and under. Structural equation modelling (SEM) was employed for the principal statistical analysis. This is an appropriate methodological approach for testing theoretical models of relations between multiple variables, particularly when there is more than one dependent variable.

### **Ethics**

#### **Ethical approval**

Ethical approval was granted by the University of Edinburgh (Appendix 2). It was not necessary to obtain ethical approval from NHS Research Ethics as this study did not recruit from the NHS or use a clinical sample.

#### **Ethical issues**

There were three main ethical issues associated with the research: confidentiality, the potential for participant distress and gaining informed consent.

#### ***Confidentiality***

Confidentiality can present as an issue within internet-based research because there is potential for participants to be identified through their Internet Protocol (IP) address (a numeric address that is given to every computer attached to the Internet). In this study the likelihood of this was minimal because whilst participant IP addresses were logged by the survey website provider (Bristol Online Surveys: BOS), this information could not be linked to a participant without assistance from the network administrator responsible for that

computer. BOS do not provide IP addresses from their server logs unless required by law. Other Internet Service Providers are required to do the same. Participant IP addresses were not accessed or stored by the researcher or shared with any third parties. This minimised confidentiality risks. Participants were informed that the survey administrators would store their IP addresses.

Within this study a 'finish later' function was available to participants during survey completion. If participants selected this function they were given the option to provide their email address to enable BOS to generate a reminder email. In this eventuality email addresses were not saved by BOS and were used only generate a reminder email. It was possible that an administrator could have seen the details of respondents wishing to return to the survey, but they would not have been able to see the content of their responses. At most institutions, email administrators are required to abide by the Data Protection Act (1998) so this information is protected. If users used personal 'home' email addresses then this was out with the researcher's control.

A further confidentiality issue was the option for participants to provide their email address if they wished to be entered into the prize draw and/or wished to receive a copy of the summary report. Although this data was held alongside questionnaire responses within BOS, email addresses were not viewed by the researcher alongside participant results. Email addresses and participant responses regarding the prize draw and summary report were exported separately to the main results and stored in a separate file. This ensured that participant responses were not linked to their contact details.

### ***Participant distress***

Participants with elevated levels of posttraumatic stress and depression could be deemed as a vulnerable group. There was potential for participant distress during or following

questionnaire completion because of the sensitive nature of research. This was of concern as participant responses were confidential and therefore personalised support or advice was not available. Several steps were taken to minimise the risk of participant distress. Participants were required to provide minimal information about their birth experiences. Details of supportive organisations, websites and telephone help-lines were provided on the initial study information page via a link and again at the end of questionnaires. Alongside this information, participants were advised to contact their GP or health visitor if they recognised symptoms of posttraumatic stress or depression, required professional support or wished to discuss issues raised by participation. In addition, participants had immediate access to an online supportive environment in which they have access to support from peers or staff. They were made aware that they could withdraw from the research at any time and their responses would not be included in the survey. Furthermore, participants could leave responses to questionnaire items blank if desired.

### ***Informed consent***

Gaining informed consent online can present as an ethical issue as there is no standard agreement regarding what constitutes informed consent using this methodology (Rhodes *et al.*, 2003). As this methodology relies completely on participant report, it is not possible to verify an individual's identity, age or capacity to consent (Rhodes *et al.*, 2003). Within non-internet based research participants are usually required to complete a written consent form, including their signature to indicate that they understand and consent to participation. In addition for face-to-face research they usually have the opportunity to discuss any queries with the researcher. Within this study which was conducted entirely online, participants accessed the study information form first. They were provided the contact details for the principal researcher whom they were encouraged to contact should they have any queries. On the next survey page participants were required to select six mandatory options to

indicate that they had read and understood the study information and gave consent to proceed. It was not possible for participants to proceed with the survey if they did not give consent to each of these options. Once these options were selected participants were able to proceed with the survey.

## **Determining sample size and power**

Hoelter (1983) proposed that for SEM a sample size of 200 is 'critical'. Any number above this is considered to provide adequate statistical power for data analysis. Therefore a sample of 200 was required. However a larger sample was sought to ensure that floor effects of low symptomatology in the general population did not confound results.

## **Participants**

Participants were women who had given birth within the last 12 months. The intention was to capture a cohort of women with a range of birthing experiences and varying levels of postnatal distress from the general population of new mothers. However, in order to answer the study's hypotheses, it was aimed to oversample from the population of mothers with postnatal symptoms of posttraumatic stress and depression. For inclusion, participants were required to be over 18 years of age, female and the birth parent of an infant aged under 12 months. The only criterion for exclusion was not meeting inclusion criteria. Participants with any level of posttraumatic stress and depressive symptomatology were included in the analysis.

## **Measures**

### **Demographic and obstetric data**

Data regarding participant age, country of residence, occupation, education, ethnic group, marital status, infant age, infant gender, marital status, parity, mode of delivery, gestational

age at birth, birth complications and if infant hospitalised, duration of hospital stay was collected.

### **Validated questionnaires**

All participants completed the following self-report questionnaires.

#### ***Maternal Postnatal Attachment scale (MPAS: Condon & Corkindale, 1998)***

This is a 19-item questionnaire measuring maternal subjective experiences towards her infant (emotions and cognitions relating to attachment context) in the first postnatal year. Each item has between 2 and 5 response choices which describe the frequency or intensity of the mother's responses to her infant. The scale can be assessed as either a full score or by three factor scores: quality of attachment, absence of hostility and pleasure in interaction. Higher scores on the subscales and total score indicate higher perceived levels of attachment. Within the original research the MPAS demonstrated adequate reliability with a minimum of  $\alpha=.78$  at 4 weeks, 4 months and 8 months and good test-retest reliability ( $\alpha=.86$ ) (Condon & Corkindale, 1998). Further research has demonstrated acceptable reliability levels at various time points between 6 weeks and 12 months postnatally with all alpha scores over .70 (Aiello & Lancaster, 2007; Feldstein *et al.*, 2004; Scopesi *et al.*, 2004). There is less evidence for the reliability of MPAS subscales. Where reported, subscale alpha scores have ranged from .76 to .53 (Feldstein *et al.*, 2004). In this study it was intended to use the full scale MPAS only, if the subscales demonstrated unacceptable levels of reliability. The questionnaire was initially validated with a sample of 260 women via correlations with a range of other constructs of psychopathology, social support and infant temperament (Condon & Corkindale, 1998). Further evidence of construct validity has been established in relation to correlations between the MPAS and measures of psychopathology (Scopesi *et al.*, 2004) and the degree of overlap (40-45%) between responses of the MPAS and another measure of the mother-infant bond; the Postpartum Bonding Inventory (PBI: Brockington *et al.*, 2001) (van Bussell *et al.*, 2010).

***Impact of Events Scale (Revised) (IES-R: Weiss & Marmar, 1997)***

This 22-item questionnaire was developed from the original Impact of Events scale (IES: Horowitz *et al.*, 1979) and is routinely used to assess posttraumatic stress. It includes three subscales: intrusion, avoidance and hyperarousal, and corresponds with the DSM (IV) PTSD criteria. Items are answered for the last seven days in relation to a stressor, specified here as childbirth. The total score gives an overall evaluation of posttraumatic stress and the subscales provide specific information for symptoms of intrusion, avoidance and hyperarousal. The subscales have demonstrated adequate - excellent reliability with alpha scores of between .87-.94 for Intrusion, .84-.90 for Avoidance and .79-.91 for Hyperarousal (Brunet *et al.*, 2003; Creamer *et al.*, 2003; Marmar *et al.*, 1996; Weiss *et al.*, 1995). The total score obtained from these three subscales shows excellent reliability with alpha scores between .92 and .96 (Brunet *et al.*, 2003; Creamer *et al.*, 2006). Six-month test-retest reliability ranged from .89 to .94 for subscale scores. There is also evidence to support its convergent and construct validity (Olde *et al.*, 2006). The IES-R has been used to measure symptoms of posttraumatic stress following childbirth (Beck *et al.*, 2011; Denis *et al.*, 2012; Olde *et al.*, 2006).

Whilst no clinical cut-off score is provided with the IES-R, a total score of 33 or above is considered to indicate clinically significant posttraumatic stress (IAPT, 2011). Clinically significant levels of distress for the individual subscales were calculated by applying the cut off scores of the IES to the IES-R. This involved calculating the percentage of the maximum score for the IES avoidance and intrusion subscales that constituted low, medium or high levels of distress. These percentages were then applied to the maximum scores for the IES-R subscales to provide cut-off scores. This method has previously been utilised (Edworthy *et al.*, 2008). For the hyperarousal subscale which does not exist in the original IES, the cut off

for intrusion was applied. Clinical cut off scores were used to calculate prevalence rates but did not affect the principal analysis which included the IES-R as a continuous variable.

***Edinburgh Post Natal Depression Scale (EPDS: Cox et al., 1987)***

This 10-item questionnaire is the mostly widely used instrument used to screen for symptoms of postnatal depression. Items are answered in relation to feelings over the last seven days with responses scored from 0-3 and a maximum score of 30. Higher scores indicate increased probability of depression. A score of 12/13 or above is indicative of clinically significant depressive symptomatology and a score of 9/10 indicates probable or mild depression (Cox *et al.*, 1987; Zuberan *et al.*, 2010). Initial support for its validity came from the original study in which all women assessed as having a diagnosis of major depressive illness according to Goldberg's Standardized Psychiatric Interview (Goldberg, 1970) were identified (using a score of 12/13) with a sensitivity of (.86) and specificity of (.78). Further evidence for the validity of the EPDS has been gathered since Cox *et al.*, (1996). Cox *et al* (1987) report satisfactory sensitivity (73%), split half reliability (.88) and internal consistency (.87).

***Parental Bonding Instrument (PBI: Parker, Tupling & Brown, 1979)***

This 25-item questionnaire measures recalled experiences of parenting received up to the age of sixteen. There is a separate questionnaire for each parent. Based upon the assumption that mothers are ordinarily the main caregiver, only the maternal form was utilised in this study. Responses are recorded on a 4 point scale, with scores for each item ranging from 0 – 3. There are two independent sub-scales 'Care' (12 items) and 'Control/Overprotection' (13 items) which emerged from a number of factor analytic studies of parental characteristics (Parker *et al.*, 1979). There is consistent evidence that both subscales have good levels of reliability, with alpha scores for the Care subscale generally reported above 0.9 and above 0.8 for Overprotection (e.g. Richman & Flaherty, 1986; Zenmore & Rinholm, 1989). The PBI has been found to correlate with attachment style as measured by the AAI (Manassis *et*

*al.*, 1999). In support for the validity of the PBI there is evidence of good concordance of ratings amongst siblings (Parker, 1990). There is also evidence that PBI scores are not affected by depressive symptoms (Gotlib *et al.*, 1988; Parker, 1981) and that perception of parenting remains consistent after recovery from a depressive episode (Brewin *et al.*, 1996).

***Metacognitions Questionnaire (short form) (MCQ-30: Wells & Cartwright-Hatton, 2004)***

This 30-item questionnaire measures five dimensions of metacognitive beliefs and processes and is a shortened version of the metacognitions questionnaire (MCQ: Cartwright-Hatton & Wells, 1997). The questionnaire has five factor scores: cognitive confidence, positive beliefs about worry, cognitive self-consciousness, negative beliefs about uncontrollability and danger of thoughts, and beliefs about need to control thoughts. Results of confirmatory and exploratory factor analysis provide support for construct validity, with results almost identical to the MCQ. Support for convergent validity comes from positive relationships between this questionnaire and other measures of worry and obsessive-compulsive symptoms (Wells & Cartwright-Hatton, 2004). Alpha scores for each subscale and the total score have demonstrated acceptable to excellent levels of reliability (cognitive confidence:  $\alpha=.93$ ; positive beliefs:  $\alpha=.92$ ; cognitive self-consciousness  $\alpha=.92$ ; negative thoughts:  $\alpha=.72$ ; need for control:  $\alpha=.72$ ; total score  $=.93$ ) (Wells & Cartwright-Hatton, 2004).

## **Procedure**

### **Creation of the survey page**

A personalised Bristol Online Survey page was created for questionnaire completion. This comprised of 11 pages which could be navigated through by selecting 'continue' at the bottom of each page. Appendix 3 shows the survey. It does not include copies of standardised measures due to copyright issues. The first page was a 'welcome' screen which stated a simple recruitment message, provided security information and invited potential participants to continue to the next page to access participant information and to



proceed with the study. Participant information which participants were required to read before proceeding with the survey was on Page 2. The consent form was on the third page. Pages 4-9 contained the questionnaires in the following order: demographic & obstetric information, MPAS, IES-R, EPDS, PBI and MCQ(30). On page 10 participants were given the option of providing their email address to enter the prize draw and/or being sent a copy of the summary report. Responses were submitted when they selected 'continue' on page 10. On the final page there was a message thanking participants, advising them to contact their GP/ health visitor if they recognised PTSS or depression and provision of contact details for supportive organisations. Participants could leave item responses blank if they wished. The research survey was open between 19/01/2012 and 07/05/12.

## **Recruitment**

Participants were recruited via the websites of the following UK birth related organisations: the Birth Trauma Association (BTA); Highland Antenatal and Postnatal Illness Support (HAPIS); the Baby Centre (traumatic birth support group and birth groups); and National Childbirth Trust (NCT). Recruitment from BTA, HAPIS and the Baby Centre (traumatic birth support group) aimed to increase sampling from mothers who experienced postnatal distress in relation to childbirth. Recruitment from the Baby Centre (birth support groups) and NCT aimed to sample from the general population of new mothers with a range of levels of postnatal distress. The above organisations were approached with initial information about the study prior to gaining ethical approval. Once ethical approval had been granted they were contacted to finalise recruitment information. A research protocol was submitted to NCT as approval was required. Approval was gained from Baby Centre group moderators post upon the support groups.

A recruitment message providing information about the study, the researcher's email address and a live link to the survey (Appendix 4) was posted upon the websites of BTA, NCT and

HAPIS by the respective organisations. Interested individuals could access the BOS survey page through this link. In addition, recruitment messages with a link to the survey page were posted by the researcher upon several Baby Centre support groups (birth groups and Traumatic Birth support group) (Appendix 4). The researcher responded to participant queries and comments upon the support group chat-rooms. In addition, a short message about the study containing the researcher's email was included in the April NCT email newsletter to their members. When participants contacted the researcher to enquire about participation, they were sent a response containing a personalised version of the recruitment message used on the websites, including a link to the survey website. As an incentive for participation, respondents were given the option to enter a prize draw to win one of three vouchers for a high street retailer. At the end of the survey participants indicated whether they wished to enter the survey and whether they wished to receive a copy of the summary report upon completion. If they decided to do so they could provide their email address.

### **Exporting data**

Once the survey was closed data for the main results (excluding email contact addresses and participant responses for the prize draw and survey) was exported into a Microsoft Excel (2010) file and then into SPSS version 19.0 (SPSS Inc.Chicago, IL). Responses for each participant were given a unique response number (URN). Where required individual item scores of the MPAS and PBI were recoded according to the instrument instructions.

Following this variable scores for each subscale and total score were calculated resulting in 17 continuous variables comprising of 4 total scores variables (IES-R Total, EPDS Total, MCQ Total, MPAS Total) and 13 subscale variables (IES-R: Intrusion, Avoidance & Hyperarousal; PBI Care & Overprotection; MCQ: Positive, Negative, Confidence Control, Need for Control & Cognitive Self Consciousness; MPAS: Quality of Attachment, Absence of Hostility & Pleasure in Interaction).



# **JOURNAL ARTICLE**

## **Posttraumatic stress following childbirth and maternal perceptions of the mother-infant bond: the role of attachment experiences and metacognition**

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*Written in accordance with the Journal of Clinical Psychology author guidelines*

*(Appendix 6)*

## **Abstract**

**Objectives:** This study tested several hypotheses regarding the relationships between maternal attachment experiences, metacognition, postnatal symptoms of PTSD and depression and perceptions of the mother-infant bond.

**Design:** An internet-based cross-sectional questionnaire design was employed in an analogue sample of new mothers.

**Methods:** Participants were 502 women recruited via birth organisations. Structural equation modelling was employed for the principal analysis.

**Results:** Results supported model fit. Metacognition fully mediated the relationship between attachment experiences and postnatal psychological outcomes. Posttraumatic stress was indirectly associated with maternal perceptions of the bond, with this relation mediated by depression.

**Conclusions:** Metacognition may have a key role in postnatal psychological distress. If postnatal depression or traumatic birth experiences are identified, screening for posttraumatic stress is strongly indicated.

**Keywords:** posttraumatic stress; childbirth; postpartum; metacognition; attachment depression

## Literature overview

Research consistently demonstrates that recalled experiences of parenting, specifically the degree of reported parental warmth and control, are associated with adult psychological outcomes (Enns, Cox & Clara, 2002; Parker & Hadzi-Pavlovic, 1992). This is broadly consistent with attachment theory (Bowlby, 1969) and supports the idea that parenting or attachment experiences contribute to risk of or protection from psychological disorder. Psychological mechanisms such as affect regulation, mentalization and reflective functioning are thought to develop within the context of early attachment relationships (Fonagy & Target, 1997). These may provide an account for the association between attachment experiences and emotional outcomes.

Metacognition is a multifaceted concept defined as psychological structures, knowledge, events and processes that are involved in the control, modification and interpretation of thinking itself (Wells & Cartwright-Hatton, 2004). It involves ‘thinking about thinking’ and in this sense is conceptually similar to Baron-Cohen’s theory of mind (1985), mentalization and reflective functioning (Fonagy, 1997; Fonagy, Gergely, Jurist & Target, 2002).

Metacognitive theory (Wells, 2000) proposes that metacognition plays a significant role in the development and maintenance of psychological disorder. A growing body of research supports this for a range of disorders (Cartwright-Hatton & Wells, 1997; Wells & Carter, 2001) including depression (Papageorgiou & Wells, 2001; Yilmaz, Gençöz & Wells, 2011) and posttraumatic stress (Bennett & Wells, 2010; Roussis & Wells, 2006). Therefore, metacognition may provide a link between attachment theory and cognitive models of psychopathology. So far the role of metacognition in postnatal psychological distress has gained little research interest.

Childbirth is recognised to be a vulnerable time for maternal psychological distress and disorder (Brockington, 2004). It is now recognised that a proportion of women experience

clinically significant symptoms of posttraumatic stress disorder (PTSD) after childbirth. Research has found that between 1.2 and 9% women develop symptoms consistent with diagnostic criteria for posttraumatic stress disorder (PTSD) (Alcorn, O'Donovan, Patrick, Creed, & Devilly, 2010; Beck, Gable, Sakala, & Declercq, 2011; Czarnocka & Slade, 2000) and approximately 30% experience partial symptoms, on at least one dimension of intrusion, avoidance or hyperarousal (Cigoli, Gilli & Saita, 2006; Czarnocka & Slade, 2000; Olde, Kleber, van der Hart & Pop, 2006). Of note, leading researchers have cautioned against pathologising symptoms because avoidance and intrusion symptoms are considered to be part of the normal adaptive process after a traumatic event. In addition, questionnaire measures of hyperarousal symptoms include items relating to sleep disturbance and hypervigilance, both which are normal and potentially adaptive in terms of optimising infant care (Slade, 2006).

The development and maintenance of posttraumatic stress following childbirth appears to be associated with wide variety of factors including trauma history (Cigoli et al., 2006; Soet, Brack & Dilorio, 2003), pre-existing anxiety and mood disorder (Alcorn et al., 2010; Denis, Parant, & Callahan, 2011) event and obstetric variables (Ryding, Wijma & Wijma, 1998; Soderquist, Wijma, Thorbert & Wijma, 2009) and cognitive appraisals of perceived support and control (Creedy, Shochet, & Horsfall, 2000; Maggioni, Margola & Filippi, 2006). Studies report a high level of comorbidity between depressive symptoms and partial symptoms or diagnostic levels of PTSD (Alcorn et al., 2010; Czarnocka & Slade, 2000).

Identification and treatment of maternal psychopathology has significant clinical implications for the mother, the developing attachment relationship and infant mental health. Psychological distress can disrupt mother-infant interactions and is recognised to increase vulnerability to child developmental, emotional and behavioural difficulties (Caplan et al., 1989; Murray, Halligan & Cooper, 2009). Consequences of postnatal psychopathology upon

mother-infant relationship outcomes have mostly been investigated in relation to postnatal depression (e.g. Caplan et al., 1989; Cogill et al, 1986) and puerperal psychosis (e.g. Snellen, Mack & Trauer, 1999). As yet, the implications of posttraumatic stress following childbirth upon the mother-infant relationship are unclear.

Whilst case series and qualitative studies have identified negative consequences upon the mother-infant relationship (Allen, 1998; Ayers, Eagle & Waring, 2006; Ballard, Stanley & Brockington, 1995) and the longer term mother-child relationship (Ayers et al., 2006; Nicholls & Ayers, 2007), quantitative research is less conclusive. The few studies which have investigated this have found that posttraumatic stress was statistically predictive of mother-infant relationship outcomes (Davies et al., 2008; McDonald, Slade, Spiby & Iles, 2011; Parfitt & Ayers, 2009) apart from one study which used a basic measure for the mother-infant bond (Ayers, Wright & Wells, 2007). However it is less clear if posttraumatic stress is independently associated with mother-infant outcomes after controlling for depression. While one study found it was (Parfitt & Ayers, 2009), for the others the effect was removed for most (Davies et al., 2008) or all mother-infant outcomes (McDonald et al., 2011) once depressive symptomatology was accounted for. Further research is needed to establish whether posttraumatic stress after childbirth is independently associated with mother infant relationship outcomes.

A high number of mother-infant dyads are potentially affected by partial or diagnostic levels of posttraumatic stress. It is of clinical importance to understand the nature of the effect of posttraumatic stress upon the mother-infant relationship because symptoms may have significant implications for the developing attachment relationship and the psychological wellbeing of the mother and the child. Early identification of distress may have important clinical implications by minimising disruption to the attachment relationship through timely delivery of appropriate interventions.



## **Aims**

This study aimed to test a number of hypotheses regarding the nature of the relationships between maternal attachment experiences, metacognition, postnatal symptoms of posttraumatic stress and depression, and maternal perceptions of the mother-infant bond.

## **Hypotheses**

*Hypothesis 1(a & b):* Maternal attachment experiences (as measured by recalled parenting experiences) will be associated with postnatal psychological outcomes (depression and posttraumatic stress) (*1a*) and have a direct effect on maternal perceptions of the mother-infant bond (*1b*)

*Hypothesis 2:* Metacognition will mediate the relationship between attachment experiences and postnatal psychological outcomes

*Hypothesis 3:* Postnatal symptoms of posttraumatic stress will have a direct effect on maternal perceptions of the mother-infant bond, independent of the effect of depression.

In addition to the above hypotheses it was expected that depression would have a direct effect on maternal perceptions of the mother infant bond and that posttraumatic stress would be associated with depression.

## **Design**

An internet-based cross-sectional questionnaire design was employed to examine predicted relationships between self-report measures of recalled parenting, metacognition, symptoms of posttraumatic stress and depression, and maternal perceptions of the mother-infant bond in an analogue sample of women in the first postnatal year. Given the multivariate nature of the hypothesised model and the need to assess the substantive relationships between the variables simultaneously, structural equation modelling (SEM) was employed for the principal statistical analysis.

## **Methods**

### **Power calculation**

Hoelter (1983) proposed a 'critical' sample size of 200 for SEM. Any number greater than 200 is considered to provide adequate statistical power for data analysis. For this study a sample of 200 was required. However, a larger sample was sought to ensure that floor effects of low symptomatology in the general population did not confound results.

### **Participants**

Participants were women who had given birth within the last 12 months recruited via the websites of various UK birth organisations. The intention was to capture a cohort with a range of birthing experiences and varying levels of postnatal distress from the general population of new mothers. However, it was planned to over-sample from the population with posttraumatic stress and depression symptoms. Websites likely to be accessed by the general population of new mothers and by individuals experiencing postnatal distress were targeted for recruitment. For inclusion, participants were required to be over 18 years of age, female and the birth parent of an infant aged under 12 months. Participants with any level of posttraumatic stress and depressive symptomatology were included in the analysis.

### **Procedure**

A survey webpage was created via Bristol Online Surveys (BOS). This contained all necessary information for participation and was open between January and May 2012. Recruitment messages were posted on websites for the Birth Trauma Association (BTA), Highland Antenatal and Postnatal Illness Support (HAPIS) and the National Childbirth Trust (NCT); and on online groups of the Baby Centre UK. Study information was also included within a NCT email newsletter. Interested individuals could access the survey webpage through a live link within the recruitment message. As an incentive, participants could enter

a prize draw to win one of three vouchers for a high street retailer. Ethical approval for the study was granted by the University of Edinburgh Ethics Committee.

## **Measures**

*Demographic and obstetric data* regarding participant age, country of residence, education, ethnicity, marital status, infant age and gender, parity, gestational age, mode of delivery, birth complications and duration of stay if infant hospitalised, was collected.

The following self-report measures were completed:

*The Maternal Postnatal Attachment Scale* (MPAS: Condon & Corkindale, 1998) is a 19-item questionnaire measuring maternal subjective experiences towards her infant (emotions and cognitions relating to attachment context). Three subscales: quality of attachment (MPAS-QA), absence of hostility (MPAS-AH) and pleasure in interaction (MPAS-PI) can be combined to provide a total score. Higher scores indicate higher perceived attachment levels. The MPAS has demonstrated adequate reliability ( $\alpha=.78$ ), good test-retest reliability ( $\alpha=.86$ ) and construct validity (Condon & Corkindale., 1998). Within this study scales demonstrated adequate-good reliability (total MPAS:  $\alpha=.88$ ; MPAS-QA:  $\alpha=.81$ ; MPAS-AH:  $\alpha=.70$ ; and, MPAS-PI:  $\alpha=.72$ ).

*The Impact of Events Scale – Revised* (IES-R: Weiss & Marmar, 1997) is a 22-item questionnaire routinely used to assess posttraumatic stress, developed from the Impact of Events scale (IES: Horowitz et al., 1979). Items are answered for the last seven days in relation to a stressor, specified here as childbirth. Three subscales: intrusion, avoidance and hyperarousal can be combined into a total score. The total and subscales demonstrate adequate-excellent reliability with alpha scores between .92 and .96 for the total score, .87-.94 for Intrusion, .84-.90 for Avoidance, and .79-.91 for Hyperarousal (Brunet, St-Hilaire, Jehel & Kind 2003; Creamer, Bell & Failla, 2006; Marmar, Weiss, Metzler, Ronfield & Foreman, 1996). There is evidence to support its convergent and construct validity (Olde,

Kleber, van der Hart & Pop, 2006). Within this study good-excellent reliability was demonstrated: IES-R Total ( $\alpha=.96$ ); Intrusion ( $\alpha=.92$ ), Avoidance ( $\alpha=.90$ ) and Hyperarousal ( $\alpha=.89$ ).

Although no clinical cut-off score is provided, a total score  $\geq 33$  is considered to indicate clinically significant posttraumatic stress (Increasing Access to Psychological Therapies, 2011). Clinically significant levels of distress for subscales were calculated by converting the percentage of maximum IES avoidance and intrusion scores (for low, medium and high distress) to the IES-R subscale maximum scores. For the hyperarousal subscale the cut off percentage for intrusion was applied.

*The Edinburgh Post Natal Depression Scale* (EPDS: Cox, Holden & Sagovsky, 1987) is a validated 10-item questionnaire routinely used to screen for postnatal depression. A score  $\geq 13$  was considered as suggestive of clinically significant symptomatology. This cut-off has demonstrated validity through the identification of major depression in women, with a sensitivity of (.86) and specificity of (.78). Cox et al (1987) report satisfactory sensitivity (.73), split half reliability (.88) and internal consistency (.87). The EPDS was found to have excellent reliability within this sample ( $\alpha=.90$ ).

*The Parental Bonding Instrument (PBI)* (Parker, Tupling & Brown, 1979) is a 25-item questionnaire which measures recalled parenting experiences during childhood and adolescence. There are separate questionnaires for each parent. Only the maternal form was utilised. There are two independent sub-scales: Care and Overprotection. Both subscales demonstrate good reliability ( $\alpha>.08$ ) and there is support for its validity (Parker, 1990).

Within this study, good- excellent reliability was demonstrated (Care:  $\alpha=.95$ ; Overprotection:  $\alpha=.87$ ). The PBI has been found to correlate with attachment style as measured by the AAI (Manassis et al., 1999).

*The Metacognitions Questionnaire (Short form)* (MCQ-30: Wells & Cartwright-Hatton, 2004) is a 30-item questionnaire measuring five dimensions of metacognitive beliefs and processes: cognitive confidence, positive beliefs about worry, cognitive self-consciousness, negative beliefs about uncontrollability of thoughts and danger, and beliefs about need to control thoughts. The total MCQ and individual subscales have demonstrated good-excellent reliability (cognitive confidence:  $\alpha=.93$ ; positive beliefs:  $\alpha=.92$ ; cognitive self-consciousness  $\alpha=.92$ ; negative thoughts:  $\alpha=.72$ ; need for control:  $\alpha=.72$ ; total score  $\alpha=.93$ ) (Wells & Cartwright-Hatton., 2004). There is also evidence for its construct and convergent validity (Wells & Cartright-Hatton, 2004). Within this study the total scale demonstrated excellent reliability ( $\alpha=.92$ ) but only one subscale had adequate reliability (negative beliefs:  $\alpha=.75$ ) with the remaining questionable (positive beliefs:  $\alpha=.62$ ; cognitive confidence  $\alpha=.66$ ; need for control:  $\alpha=.68$ , cognitive self-consciousness:  $\alpha=.67$ ).

## **Statistical Analyses**

### ***Data screening and preliminary analyses***

Initial statistical analyses were performed with SPSS version 19.0 (SPSS Inc.Chicago, IL). Less than 1% of data was missing. This was missing at random and imputed using Expectation Maximisation. For large samples it is recommended to assess for normality by visual examination of distribution histograms and by the size of skewness and kurtic values, with values  $\pm 2$  usually acceptable (Tabachnick & Fidell, 2001). Underestimates of variance associated with positive and negative kurtosis disappear within samples over 200 (Waternaux, 1976) and therefore kurtic values out with this range were not considered to influence analysis. Examination of histograms revealed that while some variables were skewed this was largely due to the floor or ceiling effects of the measures. Skew values all had values within the acceptable range. Therefore normality assessments were accepted.

Pearson's correlations were used to test associations between the dependent variables (postnatal psychological outcomes and maternal perceptions of the mother-infant bond) and infant age. Chi-square tests of independence were used to examine comorbid symptoms of depression and posttraumatic stress.

### ***Structural equation modelling***

Structural equation modelling (SEM) with the computer package MPlus Version 6 (Muthen & Muthen, 2010) was used to assess predicted relationships between variables. Maximum Likelihood (ML) estimation was utilised. A two-step approach was utilised (Anderson & Gerbing, 1988): initial confirmatory factor analysis (CFA) to establish the measurement model, followed by SEM to establish the full structural model. Data was bootstrapped to reduce the error of variance.

Based on current recommendations (Bentler, 2007) several fit indices were used to assess model fit: the root mean square of approximation (RMSEA) with 90% confidence intervals; the standardised root mean square (SRMR) and the Comparative Fit Index (CFI: Bentler, 1990). Models demonstrating good fit have a RMSEA value of  $<.06$  (Hu & Bentler, 1999) with confidence intervals  $<.08$  (Hooper, Coughlan & Mullen, 2008), a SRMR value  $>.05$  (Bryne, 1998) and a CFI  $>.95$  (Hu & Bentler, 1999).

A cross-validation technique was used to test the validity of the structural model (Camstra & Boomsma, 1992). This involved splitting sample data in two. The first half was treated as a calibration sample and the second, a validation sample. Once the model achieved a good fit with the calibration sample it was tested on the validation sample. Validity is supported if the model achieves a good fit with both samples (Hallak, 2012). Results for the full sample and the final model are reported within this paper.

## **Results**

### **Participant characteristics**

Participants were 502 women aged between 19 and 50 years. Demographic characteristics are provided in Table 2. Infant characteristics and obstetric variables are detailed in Table 3. Compared to UK statistics for year 2010-2011 (Office of National Statistics, 2011; Information & Statistics Division, 2011; Knowledge & Analytical Service, 2012) this sample had: a higher than average maternal age; a higher proportion of primiparous mothers; a higher proportion of white ethnicity; and a higher proportion of mothers married, cohabiting or in a civil partnership. This was also a highly educated sample. These factors are suggestive of a high socioeconomic class. Obstetric characteristics also differed from UK norms with a higher proportion of assisted deliveries and emergency caesareans. A high number of participants reported birth complications and infant hospitalisation.

Table 2: Participant characteristics (n=502)

Characteristic	N	%
<b>Age</b>	Mean: 31.46 yrs	SD: 4.56yrs
<b>Country of residence</b>		
UK	474	94.4
Republic of Ireland	5	1.0
Europe	13	2.6
USA	3	.6
Australia	2	.4
Asia	1	.2
(Missing values)	4	.8
<b>Ethnicity</b>		
White		
British	305	60.8
English	70	13.9
Northern Irish	8	1.6
Scottish	55	11.0
Other	33	6.6
Mixed/ Multiple ethnic groups		
White & Black Caribbean	1	.2
White & Black African	1	.2
White & Asian	1	.2
Mixed other	1	.2
Asian/Asian –Brit/ Eng/Scot/Welsh/N.Irish		
Indian	1	.2
Pakistani	2	.4
Bangladeshi	1	.2
Chinese	3	.6
Other	3	.6
Black / African/ Caribbean/ Black – Brit/Eng/Scot/Welsh/N.Irish		
African	1	.2
Caribbean	2	.4
Other	1	.2
Other ethnic group		
Other	2	.4
<b>Marital Status</b>		
Co-habiting	115	22.9
Divorced	1	.2
Married/ Civil Partnership	376	74.9
Separated	2	.4
Single	5	1.0
Would rather not say	2	.4
Missing values	1	.2
<b>Total years education</b>	Mean: 16.9 yrs	SD=3.43 yrs
<b>Number of children</b>		
1	354	70.5
2	116	23.1
3 or more	28	5.6
Missing values	4	.8



Table 3: Infant characteristics and obstetric variables

Characteristic	N	%
Infant age	Mean = 26.7 wks	SD= 12.08
Infant gender		
Male	252	50.2
Female	247	49.2
Missing values	3	.6
Gestational age		
< 29 weeks	0	0
29-34 weeks	12	2.4
35-37 weeks	20	4.0
37-42 weeks	413	82.3
Over 42 weeks	55	11.0
Missing values	2	.6
Delivery type		
Vaginal delivery: no intervention	203	40.4
Forceps/ Ventouse	128	25.5
Emergency Caesarean Section	124	24.7
Elective Caesarean Section	24	4.8
Other*	23	4.6
Birth complications		
No complications	265	52.8
Complications	235	46.8
Missing values	2	.6
Hospitalisation		
Yes	134	26.7
No	367	73.1
Missing values	1	.2
Length of incubation, if hospitalised	mean=7.8 days (n=48)	S.D = 11.65

\* = This usually described a combination of modes e.g. induction followed by instrumental, followed by emergency caesarean section

### Predictor and outcome variables

Mean scores for predictor and outcome variables are shown in Table 4. There was a small negative correlation between infant age and symptoms of intrusion ( $r = -.10$ ,  $n=502$ ,  $p<.05$ ).

No significant correlations were found between infant age and the remaining total or subscales of the IES-R, EPDS or MPAS ( $p>.05$ ).

Table 4: Mean scores for predictor and outcome variables

Variable	Mean (+- SD)	Range	N
Parental Bond Inventory			
PBI Care	26.29 (9.29)	0 -36	502
PBI Overprotection	38.37 (7.55)	0 -37	502
Metacognition (MCQ 30) (total score)	57.73 (14.98)	30-110	502
MCQ Positive Beliefs	10.4 (3.10)	6-23	502
MCQ Negative Beliefs	11.83 (3.78)	6-24	502
MCQ Cognitive Control	12.46 (3.36)	6-24	502
MCQ Need for Control	10.76 (3.50)	6-22	502
MCQ Cognitive Self Consciousness	12.28 (3.43)	6-24	502
IES-R total score	16.39 (17.67)	0-84	502
IES-R Intrusion	7.33 (7.39)	0-32	502
IES-R Avoidance	6.19 (7.04)	0-32	502
IES-R Hyperarousal	2.88 (4.64)	0-24	502
EPDS	8.55 (5.90)	0-27	502
Maternal Postnatal Attachment Scale (MPAS) total score	78.64 (10.23)	36.31-95	502
MPAS Quality of Attachment	39.13 (4.75)	19.32-45	502
MPAS Absence of Hostility	18.31 (3.57)	7-25.00	502
MPAS Pleasure in Interaction	21.21 (3.71)	7-25.00	502

### Posttraumatic Stress and Depression

Table 5 displays the total number of participants who reported high, medium or low levels of distress on the total IES-R cross tabulated with depression levels.

Table 5: Cross tabulation of IES-R and EPDS clinical cut off scores.

IES-R cut off scores		EPDS cut off scores			Sample Total
		Low (0-9)	Possible depression (10-12)	Depression likely (13+)	
IES-R total	Subclinical (0-32)	296 (58.9%)	50(10%)	61 (12.2%)	407 (81.1%)
	Clinically significant (33- 88)	23 (4.6%)	12 (2.4%)	60 (12.0%)	95 (18.9%)
Sample Total		319 (63.5%)	62 (12.4%)	121 (24.1%)	502 (100%)

18.9% ( $n=95$ ) of the sample reported clinically significant PTSS as measured by the total IES-R (scoring  $\geq 33$ ). There was highly significant relationship between participant posttraumatic stress and depression status ( $\chi^2(2, n=502) = 102.89, p < .001$ ) as measured by total IES-R. In addition, highly significant associations were found between depression and posttraumatic stress status for each subscales: Intrusions ( $\chi^2(4, n=502) = 110.64, p < .001$ ), Avoidance  $\chi^2(4, n=502) = 99.81, p < .001$ ) and Hyperarousal  $\chi^2(4, n=502) = 164.36, p < .001$ ).

#### ***Maternal Perceptions of mother infant bond***

Total MPAS scores indicated that on average, participants rated high levels of attachment to their infants.

#### **Measurement model**

Three latent variables were included in the measurement model: attachment experiences, posttraumatic stress and mother-infant bond. The variable metacognition was included as an observed rather than a latent variable due to unacceptable subscale reliability coefficients.

The measurement model was a good fit of the data:  $\chi^2(502) = 23.698(11) p = .0141$ , CFI = .992, RMSEA = .048 (.21-.75), SRMR = .017. All factor loadings were significant with a range from .59 to .92. Table 6 details loadings and indicators of the measurement model.

Table 6: Latent constructs, indicators, loadings and errors of the final 3 factor measurement model

Latent variable	Indicator	Loading	Error
Attachment experiences	Care PBI subscale	.624	.096
	Overprotection PBI subscale	-.589	.092
Posttraumatic stress symptoms (PTSS)	Intrusion IES-R subscale	.924	.011
	Avoidance IES-R subscale	.831	.016
	Hyperarousal IES-R subscale	.903	.012
Maternal perceptions of mother infant bond (MIB)	Quality of Attachment MPAS subscale	.898	.043
	Absence of Hostility MPAS subscale	.752	.040

### Structural model

The observed variables depression and metacognition were introduced to the measurement model. There was no concern about multicollinearity as correlations between latent variables, depression and metacognition ranged from .126 to .589. Five a-priori nested structural models were constructed. Each model specified a slightly different combination of regression paths between the variables. In accordance with the hypotheses, the nature of the relationships between variables, including full or partially mediated paths were estimated and compared in terms of model fit. The final model was selected on the basis of being the most representative of the sample data and the most parsimonious.

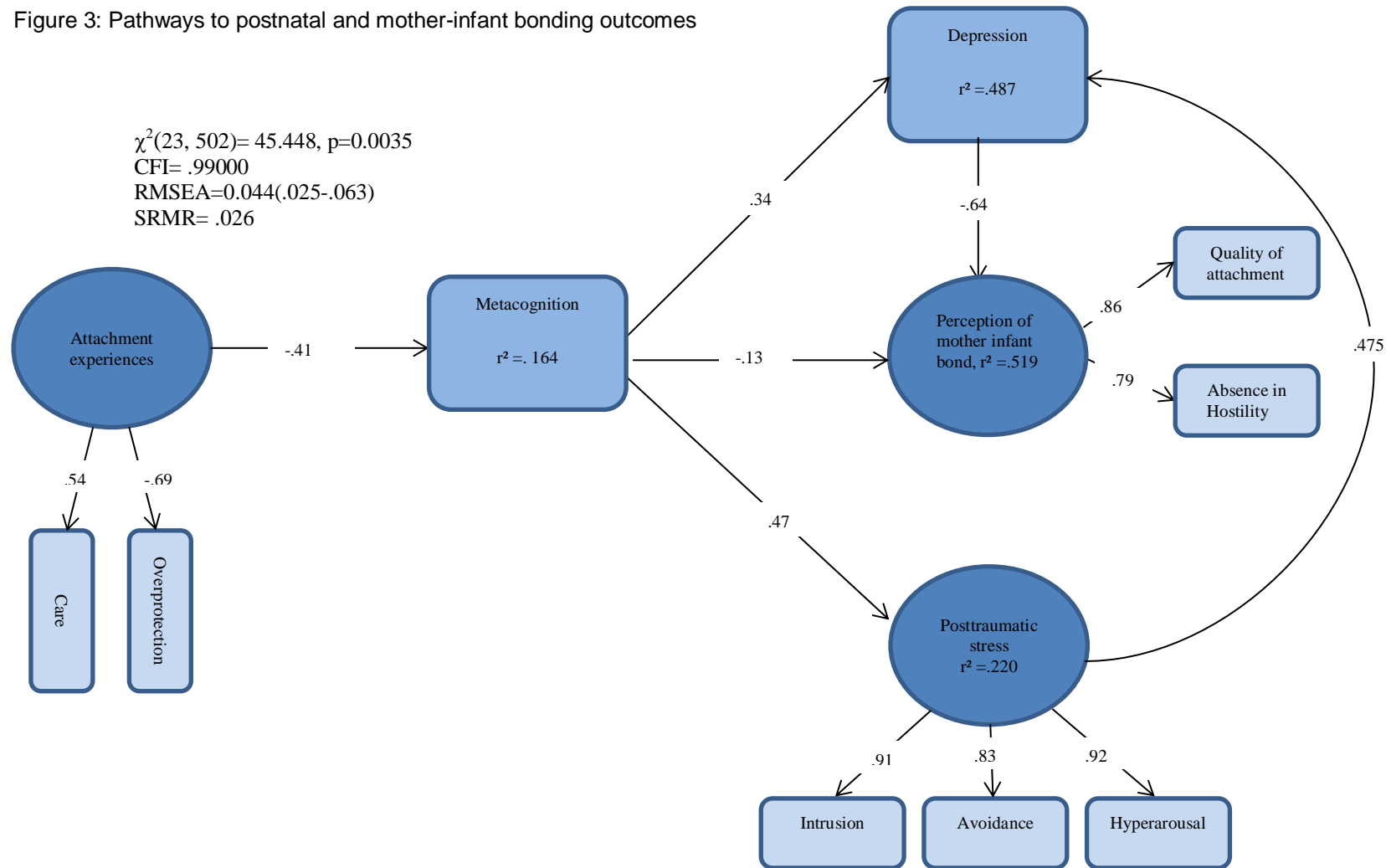
There was no significant difference in Chi-square between the models. This indicated that none were of superior fit. However, within four models at least one of the specified paths were of negligible magnitude and statistically insignificant. On this basis, the remaining model in which all specified paths were significant was selected. This was the most parsimonious model in which metacognition fully mediated the effect of attachment experiences upon postnatal outcomes, and depression fully mediated the effect of

posttraumatic stress upon the mother infant bond. The model was of good fit to the data ( $\chi^2(502, 24) = 54.173, p=.0004, CFI=.987, RMSEA=.05 (.032-.068), SRMR=.031$ ).

As an exploratory step, based on conceptual similarities between metacognition, mentalization and reflective functioning, a parameter between metacognition and mother-infant bond was specified. This model was a significantly improved fit ( $\chi^2(502, 23) = 45.448, p=.0035, CFI=.990, RMSEA=.044 (.025-.063), SRMR=.026$ ) and was selected as the final model. The model is illustrated in Figure 3 with estimated parameter values between variables.

Within the final model there was a medium direct effect from attachment experiences to metacognition ( $\beta = -.41$ ). Metacognition had a medium direct effect upon depression ( $\beta = .34$ ) and posttraumatic stress ( $\beta = .47$ ) and a small direct effect maternal perceptions of the mother-infant-bond ( $\beta = -.13$ ). Posttraumatic stress had a medium direct effect on depression ( $\beta = .48$ ). Depression had a large direct effect on maternal perceptions of the mother –infant bond ( $\beta = -.64$ ). Attachment experiences had a small indirect effect upon posttraumatic stress ( $\beta = -.19$ ) and depression ( $\beta = -.14$ ), both fully mediated by metacognition. The indirect relationship between attachment and mother-infant bond, fully mediated by metacognition was of negligible magnitude ( $\beta = .05$ ). Posttraumatic stress had a medium indirect effect upon the mother-infant bond, fully mediated by depression ( $\beta = -.30, p \leq .001$ ). The final model explained 16.4% of the variance of metacognition, 22.0% of the variance in posttraumatic stress, 48.7% of the variance of depression and 51.9% of the variance of maternal perceptions of the mother infant bond. Fit indices for the calibration and validation samples indicated that the model was a good fit with both samples, supporting the validity of the final model.

Figure 3: Pathways to postnatal and mother-infant bonding outcomes



## **Discussion**

### **Main findings**

The main aim of this study was to examine predicted relationships between a number of variables within the first postnatal year, specifically attachment experiences, metacognition, postnatal symptoms of posttraumatic stress and depression, and maternal perceptions of the mother-infant bond. Within the model of best fit, the relationship between attachment and postnatal psychological outcomes was fully mediated by metacognition but attachment was not directly associated with the mother infant bond. Posttraumatic stress was not directly associated with the mother-infant bond as this relationship was fully mediated by depression. Findings provided partial support for the first hypothesis, full support for the second and no support for the third.

The indirect relationship between attachment experiences and postnatal psychological outcomes indicates that a mother's childhood attachment experiences have consequences upon postnatal psychological wellbeing. This corresponds with research which indicates that the degree of parental warmth and control constitutes vulnerability to or protection from adult emotional disorder (Enns et al., 2002; Mahedy, Gordon & Bunting, 2011). More broadly, results are consistent with attachment theory (Bowlby, 1969) which proposes that attachment representations, which develop within the context of early attachment relationships, constitute risk or protection from emotional disorder. This also corresponds to the conceptualisation of the attachment system as an emotional regulation device (Mikulincer & Shaver, 2007).

As hypothesised, metacognition mediated the relationship between attachment experiences and postnatal psychological outcomes and had a direct effect upon these variables. The strength of the association between attachment experiences and metacognition provides strong support that metacognitive beliefs and strategies may develop within the context of

attachment relationships. This finding is broadly consistent with psychological theories such as cognitive theory (Beck, 1979) and social learning theory (Bandura, 1977) which propose that beliefs and coping strategies are shaped by parenting experiences. It is also possible that this association may be attributed to conceptual similarities between metacognition, mentalization and reflective functioning, linked via their association with theory of mind. As noted, mentalization, reflective functioning and affect regulation all develop within the context of early attachment relationships, and therefore may plausibly account for the association between attachment experiences and metacognition. The association between metacognition and postnatal psychopathology is consistent with metacognitive theory of psychological disorder (Wells, 2000) and research which implicates metacognition in the development and maintenance of depression (Papageorgio & Wells, 2000; Yilmaz et al., 2011) and posttraumatic stress (Bennet & Wells, 2010; Wells & Colbear, 2012). The strength of these relationships strongly supports the significance of metacognition in relation to postnatal emotional distress. Although it cannot be concluded whether metacognitive beliefs and strategies acted as a pre-existing vulnerability or developed in response to symptoms, or both; the direct association between attachment experiences and metacognition provides some evidence for the former. To the authors' knowledge, this is the first study to identify the association between metacognition and postnatal symptoms of depression and posttraumatic stress in a non-clinical sample.

Based on attachment theory it was predicted that attachment experiences would be directly associated with maternal perceptions of the mother-infant bond. Surprisingly, no direct association was found and the indirect effect between these variables was of negligible size. This finding is likely to be related to the constructs measured within this study and limitations associated with self-report instruments. Despite indications that the PBI correlates with attachment representations (Manassis et al., 1999), this instrument does not assess attachment style per se and may not be sensitive or conceptually similar enough to be



associated with maternal perceptions of mother-infant relations. Although the PBI was predictive of metacognition and indirectly of mental health outcomes, these associations could reflect a wide range of consequences of parenting upon cognitive and psychological outcomes. Similarly, whilst maternal perceptions of the mother-infant relationship are likely to be influenced by maternal representations, the construct measured by the MPAS is conceptually distinct from this and from direct observational assessment of aspects of the dyadic attachment relationship commonly utilised in research e.g. the CARE index (Crittendon, 1979-2004) or the Strange Situation Paradigm (Ainsworth, Blehar, Waters & Wall, 1978). However, the MPAS was sensitive to the well-established deleterious effect of depression upon the mother-infant relationship outcomes (Murray et al., 2009; Stein et al., 1991) thus providing support for its utility.

The small direct effect from metacognition to the mother-infant bond could also be attributable to the aforementioned similarities between mentalization, reflective functioning and metacognition. If so, this would be consistent with the role of maternal reflective functioning in the developing mother-infant relationship (Fonagy, Steele, Moran, Steele, & Higgitt, 1991; Slade, 2005; Slade & Cohen, 1996). Furthermore, the finding that metacognition fully mediated the relationship between attachment experiences and the mother-infant bond is consistent with the proposition that maternal reflective functioning may provide the psychological mechanism for the intergenerational transmission of attachment organisation (Slade, 2005; Grienemberger, Kelly & Slade, 2005).

Contrary to the third hypothesis, posttraumatic stress did not independently predict perceptions of the mother-infant bond. This corresponds with previous research that utilised a longitudinal or repeated measures design and a number of different instruments to assess mother-infant/child relationship outcomes (McDonald et al., 2011; Davies et al., 2008). Interestingly this contrasts with the findings of Parfitt & Ayers (2007) who used a similar

cross-sectional design, internet sourced sampling and method of analysis. This study's results also differ from those of qualitative studies (Allen, 1998; Ayers et al., 2006; Nicholls & Ayers, 2007). This could be attributable to differences in sampling and timing of assessment. It is possible that the MPAS is particularly sensitive to the effect of depression rather than posttraumatic stress as many items relate to affect and cognitions about the parent-infant relationship.

Within the current study there was an indirect effect of medium magnitude between posttraumatic stress and the mother-infant bond, fully mediated by depression. This indicates that symptoms of posttraumatic stress may not directly influence maternal perceptions of the bond. It is possible that posttraumatic stress symptoms, for example intrusive memories, hyper-vigilance and cognitive avoidance have lesser consequences upon the aspects of maternal affect, cognition and behaviour which directly relate to the developing attachment relationship in comparison to depressive symptomatology. For instance, depressive symptoms such as reduced responsiveness, negative affect or apathy are more likely to have negative consequences upon maternal sensitivity and affect within mother-infant interactions and to influence maternal perceptions of her infant or the mother-infant relationship. Therefore these symptoms may constitute a greater risk to the developing attachment relationship. However, symptoms of posttraumatic stress may increase the likelihood of depression by acting either as a precipitant or compounding factor to depressive symptomatology, which in turn directly influences perceptions of the mother-infant relationship. It is also possible that a pre-existing vulnerability to emotional disorder may account for co-morbid depressive and traumatic stress symptoms. It appears that metacognitive beliefs and processes, which were directly associated with all three variables may have a key role in their interrelationship.

It has been suggested that the use of the EPDS as a measure of depression may confound results (Davies et al., 2008) as it has been demonstrated to be a reliable indicator of anxiety (Brockington, 2004). However, most commonly utilised measures of depression have high correlations with anxiety measures, potentially due to the high degree of overlap between symptoms of the disorders and frequent comorbidity. Of note, McDonald et al (2011) used the Hospital & Anxiety Depression Scale (HADS: Zigmond & Snaith, 1983) as an alternative depression scale and still found that there was no direct effect of posttraumatic stress upon mother-infant outcomes after controlling for depression. This suggests that the use of the EPDS did not confound results any more than an alternative measure may have.

As anticipated, a high proportion of participants reported clinically significant posttraumatic stress and depression within this study. This corresponds with the finding that internet samples over represent symptomatic women (Ayers et al., 2008). Within this sample, a high proportion of participants reported complications with the birth. This could have been related to the higher than average maternal age. An interesting finding was that a smaller proportion of participants reported medium and high symptom levels for hyperarousal in comparison to intrusions or avoidance. This is contrary to suggestions that these symptoms may constitute normal postnatal experiences (Slade, 2006). One possible explanation is that symptoms patterns may reflect non-specific distress rather than a specific trauma response, as suggested by Ayers et al., (2009). Alternatively this could be related to the method used to determine the clinically significant distress.

### **Strengths and limitations**

This study contributes to current knowledge of postnatal traumatic stress, depression and the developing mother-infant relationship by integrating several psychological theories and exploring interrelationships between variables. Although there were differences between the demographic and obstetric characteristics of the sample and national statistics, the sample

could be considered to be broadly representative of postnatal women in the UK. From a statistical perspective, the large sample minimised the role of potential confounding variables. In addition, a powerful method of analysis was utilised and the validity of results were supported.

Findings should be interpreted within the context of a number of shortcomings and broader limitations. Firstly, as prior symptoms were not assessed it cannot be established whether or not posttraumatic stress symptoms developed in relation to childbirth. Secondly, whereas the sampling strategy was appropriate for the hypotheses there may have been a self-selection bias which limits the possibility of generalisation. Thirdly, paternal attachment experiences were not captured as only the maternal PBI questionnaire was utilised. Lastly, the cross-sectional design limits conclusions regarding temporal relations between variables. More broadly, self-report measures are sensitive to a social desirability bias which may be a particular issue for postnatal mothers. However this bias may have been minimised by the anonymity associated with internet based research. In addition, this study utilised self-report measures of psychopathology which are not equivalent to clinical assessment of symptoms.

### **Implications for clinical practice and research**

In terms of clinical implications, the association between metacognition and psychological outcomes provides strong support that metacognitive therapy may be an appropriate intervention for posttraumatic stress following childbirth and postnatal depression. Results indicate that posttraumatic stress may not directly influence maternal perceptions of the mother-infant bond. However, it is still clinically important to identify symptoms to reduce maternal distress and associated consequences such as depressed mood, which in turn are associated with negative consequences for the developing attachment relationship. New mothers are routinely screened for postnatal depression. Screening could be extended to include posttraumatic stress but with consideration to the high degree of comorbidity with

postnatal depression, the identification of probable depression is likely to identify most individuals who experience posttraumatic stress. However symptoms could go unrecognised unless they are specifically screened for or birth experiences enquired about. Therefore it is recommended that birth experiences are explored alongside routine depression screening. If difficult or traumatic birth experiences are reported or probable depression is identified, then posttraumatic stress is strongly indicated. This should allow identification of symptoms across both disorders and enable access to intervention, if appropriate.

There are a number of pathways for future research. Firstly, further evidence regarding the nature of the relationship between posttraumatic stress following childbirth and mother-infant outcomes is required. Ideally studies would be of prospective longitudinal design, controlling for posttraumatic stress and depression during pregnancy and include additional or alternative measures of mother-infant relationship outcomes, or alternatively an observational measure of dyadic interaction. Secondly, studies should investigate the applicability of metacognitive theory to posttraumatic stress following childbirth, including its potential role in the relationship between posttraumatic stress and depression. Whilst resource intensive, these findings justify conducting research with a longitudinal design utilising the Adult Attachment Interview (AAI: George, Kaplan & Main, 1985) to assess maternal attachment representations as an alternative to the PBI, include an additional assessment of reflective functioning (Fonagy, Target, Steele & Steele, 1998) and explore whether this is predictive of mother infant bond.

## **Conclusions**

Findings contribute to research by modelling estimated interactions between a mother's attachment experiences, metacognition, postnatal psychological outcomes and mother-infant relationship outcomes. Metacognition may have a key role in the development and maintenance of postnatal depression and posttraumatic stress. There is strong support that

metacognitive therapy may be an appropriate treatment approach for these postnatal psychological disorders. Results indicate that postnatal symptoms of traumatic stress may not directly influence the mother-infant bond but are strongly associated with depression, which has an established negative effect upon mother-infant relationship outcomes. Birth experiences should routinely be explored alongside postnatal depression screening. If probable depression or difficult birth experiences are identified, symptoms of posttraumatic stress should be enquired about and screened for in order to minimise potential adverse consequences and enable timely intervention.

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## **ADDITIONAL RESULTS**

### **Part 1: An overview of the analytic method and preliminary analysis**

#### **Overview of analytic method**

A preliminary analysis of the data was carried out in SPSS (Version 19) to screen and assess for missing data, normality of variable distribution, outliers, multivariate normality, and the absence of multicollinearity and singularity. Missing data was imputed and final variable scores were calculated. The reliability of each variable was calculated. Descriptive statistical analyses were carried out for demographic and obstetric characteristics, and for postnatal psychological outcomes. The sample's demographic and birth characteristics were compared to UK national statistics. Correlations between obstetric characteristics and psychological outcomes were calculated. Structural equation modelling (SEM) using the computer package MPlus Version 6 (Muthen & Muthen, 2010) was employed for the primary method of analysis, to assess predicted relationships between variables within the proposed model. SEM has a number of assumptions including: multivariate normality, absence of outliers, linearity and the absence of multicollinearity and singularity (Tabachnick & Fidell, 2001). These assumptions were assessed as detailed below.

#### **Preliminary analyses**

##### ***Missing data analysis***

Missing values analysis was carried out in SPSS (Version 19) for all continuous variables (outcome measures, maternal age, infant age and education in years). Less than 1% of data values were missing. It is important to establish the pattern to missing data values in order to select an appropriate method for data imputation. First, Little's MCAR test was used to

assess whether values were missing completely at random (MCAR). This revealed that data was not MCAR ( $\chi^2(11141) = 11984.01, p=.000$ ). Next, it was important to establish if the data was missing at random (MAR). Separate variance t-tests were used to explore whether demographic and obstetric variables were associated with missing data values for outcome variables. These were set to calculate variables with missing values in at least 1% of cases, as no variables had missing values in 5% of cases. No patterns were identified and it was concluded that data was missing at random (MAR). Data which is MAR pose less serious risks to the generalisability of the results than data which is not missing at random (NMAR) (Tabachnick & Fidell, 2001). Expectation Maximisation (EM), a data imputation technique available for randomly missing data, was used to impute missing values.

### ***Distribution***

Some skewness and kurtosis was expected due to the nature of the constructs measured within a non-clinical sample. A positive skew was expected for depression and posttraumatic stress screening questionnaires due to an anticipated healthy sample. Similarly, a negative skew was expected on the MPAS, where high scores indicated a perceived positive bond with the infant.

Distribution normality can be assessed in a number of manners including by visual examination of distribution histograms, skewness and kurtosis values, formal inference tests and Z scores. Within large samples Z scores are usually inflated and may incorrectly indicate significant skewness and/or kurtosis. Furthermore, for large samples the significance level of skewness is less important than its size and the visual appearance of the distribution because a significantly skewed variable often does not deviate enough from normality to make a substantive difference to analyses (Tabachnick & Fidell, 2001). Therefore, it is recommended to assess normality and kurtosis of large samples by visual examination of distribution histograms and the sizes of skewness and kurtosis values (Tabachnick & Fidell,

2001). Of note, underestimates of variance associated with positive kurtosis disappear with samples greater than 100 cases and those associated with negative kurtosis disappear with samples of over 200 (Waternaux, 1976).

Within this study skewness and kurtosis for all outcome variables, maternal age and infant age were assessed by visual examination of distribution histograms and by skew and kurtosis values. In accordance with a general rule of thumb, a skewness and kurtosis value of  $\pm 1$  was considered good for psychometric purposes and a value of  $\pm 2$  was acceptable. Table 7 displays these values for all outcome variables with standard errors.

Values revealed that some variables were skewed and/or kurtic, however most were within the acceptable range ( $\pm 2$ ). Three variables had kurtosis values greater than 2, deemed to be an unacceptable level of kurtosis. However, as previously noted in large samples the underestimations of variance associated with positive kurtosis disappear. With a sample greater than 500 it was assumed that high values would not adversely analyses. For skewness with the exception of one variable (IES-R hyperarousal) all had acceptable levels of skewness ( $\pm 2$ ). This variable had a value of 2.066 and on consideration was deemed to be close enough to 2 to be considered acceptable.

Table 7: Skewness and kurtosis statistics and standard errors

	Skewness		Kurtosis	
	Statistic	Std. error	Statistic	Std. error
<b>IES-R</b>				
<b>Total score</b>	1.299	.109	1.133	.218
<b>Intrusion</b>	1.163	.109	.611	.218
<b>Avoidance</b>	1.217	.109	.737	.218
<b>Hyperarousal</b>	2.066	.109	3.993	.218
<b>EPDS total score</b>	.717	.109	-.028	.218
<b>MCQ (30)</b>				
<b>Total score</b>	.641	.109	.234	.218
<b>Positive beliefs</b>	.948	.109	1.126	.218
<b>Negative beliefs</b>	.495	.109	-.335	.218
<b>Cognitive control</b>	.495	.109	.168	.218
<b>Need for control</b>	.866	.109	.260	.218
<b>Cognitive self-consciousness</b>	.419	.109	-.111	.218
<b>PBI</b>				
<b>Care</b>	-.933	.109	-.010	.218
<b>Overprotection</b>	.675	.109	.076	.218
<b>MPAS</b>				
<b>Total</b>	-1.193	.109	1.678	.218
<b>Quality of Interaction</b>	-1.295	.109	2.088	.218
<b>Absence of Hostility</b>	-.511	.109	-.047	.218
<b>Pleasure in Interaction</b>	-1.512	.109	2.088	.218
<b>Maternal age</b>	.132	.109	.396	.218
<b>Infant age</b>	.309	.109	-.718	.218

Visual examination of the distribution histograms revealed that most outcome variables had some deviation from normality. On inspection, the IES total and subscale scores appeared to form the top half of a normal distribution curve but with a high proportion of participants scoring low values, indicating high kurtosis and positive skewness. This most likely indicates a floor effect, which would be expected when using a measure of psychopathology with a healthy sample. The EPDS visually appeared as a normal distribution curve with the lower quarter missing, with positive skew and low kurtosis. The MCQ total score distribution appeared to be normal with a slight positive skew and low kurtosis. The distribution of each MCQ subscale score represented normal distribution curves with a small proportion of the lower curve missing (slight positive skew). PBI Care appeared to form the lower half of a normal distribution curve (negative skew) which likely indicates a ceiling effect of the measure. PBI Overprotection appeared as a normal distribution curve with the lower quarter missing, indicating a slight positive skew. On inspection, MPAS total appeared to form a normal distribution curve with a negative skew and high kurtosis. MPAS Pleasure in Interaction appeared to have a ceiling effect with the upper half of the distribution curve missing, giving the distribution curve a negative skew and high kurtosis. Similarly MPAS Absence of Hostility had a negative skew and high kurtosis.

Whilst visual inspection of histograms and corresponding values revealed some variables were skewed or kurtic, this could largely be attributed to a floor or ceiling effect of the measures. As noted with a sample greater than 500 it was assumed that high kurtosis values would not adversely analyses. Skew values were also deemed acceptable. With consideration to these factors normality assumptions were accepted and variables were not transformed.

### ***Outliers***

Examination of the data with box plots revealed numerous apparent outliers for most variables. Only three variables had less than five outliers and six variables had over ten,

including twenty-two apparent outliers for Hyperarousal. On visual inspection, these values fell within the upper or lower tail of the distribution curve (for a negative or positive skew, respectively) rather than representing one or two extreme values which deviated significantly from the mean. Therefore these values were not deemed to be outliers and it was decided to retain these values within the analysis.

***Reliability and absence of Multicollinearity***

This is reported in the journal article.

## **Part 2: Descriptive statistics**

### **Participant characteristics and obstetric data**

502 women aged between 19 and 50 years participated in the research. Respondents were predominantly of white ethnicity ( $n=381$ , 93.9%), UK residents ( $n=474$ , 94.4%) and either married, civil partners or cohabiting with their partner ( $n=491$ , 97.8%). This was a highly educated sample with a mean of 16.9 total years in education. The majority of participants were primiparous ( $n=354$ , 70.5%).

Infant age ranged from 1 to 52 weeks. The majority were born at full term ( $n=413$ , 82.3%). Participant responses within the 'other' category for mode of delivery usually described a combination of modes e.g. induction, followed by then instrumental, followed by emergency caesarean section.

### **How representative was the sample?**

Demographic and obstetric variables were compared to UK birth statistics for year 2010-2011 from Office of National Statistics (ONS, 2011), Information and Statistics Division (ISD, 2011) and Knowledge & Analytical Services (Welsh Government, 2012) to evaluate how representative the sample was of UK birthing mothers and birth characteristics.

The sample mean age was higher than the average age for giving birth in England, Scotland, Wales and Northern Ireland (31.46 compared with 29.6, 29.6, 29.0 and 30.1, respectively) (ONS, 2011). Of note, the average age for primiparas is lower than for all birthing mothers (e.g. 27.8 years in England and Wales) (ONS, 2011). As 70.5% of participants were primiparous, it can be assumed that the sample average age was a minimum of 2 years greater than the UK mean. A higher proportion were either married, civil partnership or cohabiting ( $n=491$ , 97.8%) compared to the national statistics of England & Wales where 84% of babies were registered by parents who were married, in civil partnership or cohabiting. The proportion of the sample who were of white ethnicity was marginally greater compared

to the latest statistics available on the UK population (93.9% ( $n=471$ ) compared to 91.9% White British, Irish or other White) (ONS, 2006)

For gestational age, the sample was approximately equivalent to Scotland's population birth characteristics for premature birth, with a total of 6.4% ( $n=32$ ) of the sample's infants born at a gestational age of under 37 weeks compared to 6.8% of Scottish births for the year ending March 2010 (ISD, 2011). However a smaller proportion of participant's infants were born at full term (82.3% compared with 89.9%) and a larger proportion born overdue (11% ( $n=55$ ) compared to 2.9%) (ISD, 2011). The sample had lower rates of normal (unassisted) delivery compared to UK wide statistics for 2010 (40.4% ( $n=203$ ) compared with 61.7% for Scotland, 62.2% for England and 61% for Wales); higher rates of instrumental delivery (25.5% ( $n=128$ ) compared with 12.6% , 12.5% and 12.5% for Scotland, England and Wales, respectively); higher rates emergency caesarean (24.7% ( $n=124$ ) compared with 14.9%, 14.8% and 15% for Scotland, England and Wales, respectively); lower rates of elective caesarean (4.8% ( $n=24$ ) compared with 10.5%, 10.1% and 15% for Scotland, England and Wales, respectively).

### **Independent variables**

The table with mean scores, standard deviation and range of scores for each variable is displayed in the journal article.

### ***Attachment experiences***

PBI Care scores ranged from 0-36 with a mean of 26.29 ( $SD=9.29$ ). PBI Overprotection scores ranged from 0-37 with a mean of 12.08 ( $SD=7.55$ ). Table 8 shows the number and proportion of participants assigned to parental bonding quadrants. 43.8% of participants ( $n=220$ ) reported optimal parenting experiences from their mothers and 17.9% reported neglectful parenting ( $n=90$ ).



Table 8: Parental bonding quadrants

	<b>Low Protection</b>	<b>High protection</b>	<b>Total</b>
<b>Low Care</b>	‘Neglectful parenting’	‘Affectionless control’	
	90 (17.9%)	117 (23.3%)	207 (41.2%)
<b>High Care</b>	‘Optimal parenting’	‘Affectionate constraint’	
	220 (43.8%)	75 (14.9%)	295 (58.8%)
<b>Total</b>	310 (61.8%)	192 (38.2 %)	

### ***Metacognition***

Scores for the total MCQ-30 ranged from 30-110 with a mean of 57.73 (SD=14.98). For the individual subscales, scores for Positive beliefs ranged from 6-23 with a mean of 10.4 (SD=3.10). Negative beliefs scores ranged from 6-24 with a mean of 11.83 (SD=3.78). Cognitive control scores ranged from 6-24 with a mean of 12.46 (SD=3.36). Need for control scores ranged from 6-22 with a mean of 10.76 (SD=3.50). Cognitive Self Consciousness scores ranged from 6-24 with a mean of 12.28 (SD=3.43). Higher total scores on the MCQ-30 indicate a more maladaptive metacognitive style and vulnerability to psychopathology.

### **Dependent variables**

A cross tabulation of levels of posttraumatic stress (total IES-R) and depression scores according to the frequency and percentage of the sample is displayed in the journal article.

### ***Posttraumatic stress symptomatology***

Total IES-R scores ranged from 0-84 with a mean of 16.39 (SD=17.39). For the individual subscales, scores on Intrusion ranged from 0-32 with a mean of 7.33 (SD=7.39). Avoidance scores ranged from 0-32 with a mean of 6.19 (SD=7.04). Hyperarousal scores ranged from 0-32 with a mean of 2.88 (SD=4.64).

Prevalence figures for the total sample according to the total IES-R are reported in the journal article. Table 9 displays the total number of participants who reported high, medium or low levels of distress on the IES-R subscales cross tabulated with depression levels. Of note, these differ from those reported in the text below, which represent the total prevalence of high, medium and low levels of distress for the IES subscales for the sample.

Table 9: Cross tabulation of IES-R subscale and EPDS clinical cut of scores

	IES-R subscale cut off scores	EPDS cut off scores			Sample Total
		Low (0-9)	Possible depression (10-12)	Depression likely (13+)	
<b>Intrusion</b>	<b>Low (0-7)</b>	248 (49.4%)	39 (7.8%)	35 (7.0%)	322 (64.1%)
	<b>Medium (8-17)</b>	59 (11.8%)	16 (3.2%)	46 (9.2%)	121 (24.1%)
	<b>High (18-32)</b>	12 (2.4%)	7 (1.4%)	40 (8.0%)	59 (11.8%)
<b>Avoidance</b>	<b>Low (0-6)</b>	248 (49.4%)	32 (6.4%)	41 (8.2%)	321 (63.9%)
	<b>Medium (7-15)</b>	51 (10.2%)	25 (5.0%)	39 (7.8%)	115 (22.9%)
	<b>High (16-32)</b>	20 (4.0%)	5 (1%)	41 (8.2%)	66 (13.1%)
<b>Hyperarousal</b>	<b>Low (0-5)</b>	307 (61.2%)	47 (9.4%)	53 (10.6%)	407 (81.1%)
	<b>Medium (6-11)</b>	8 (1.6%)	12 (2.4%)	37 (7.4%)	57 (11.4%)
	<b>High (12-24)</b>	4 (0.8%)	3 (0.6%)	31 (6.2%)	38 (7.6%)

Note: Percentages do not represent total % of sample as participants contribute to more than one group.

A total of 19.1% of the sample (n=91) reported high levels of distress on one or more subscale, comprised of 23 (4.6%) on three subscales, 23 (4.6%) on two subscales and 45 (8.9%) on one. An additional 25.5% (n=128) reported medium levels of distress on one or more subscales, comprising of 16 (3.2%) on three subscales, 52 (10.4%) on two subscales and 60 (12.0%) on one. Therefore in total, 43.6% of the sample (n=219) reported high or medium levels of distress on at least one subscale.

### ***Depressive symptomatology***

The mean EPDS score was 8.55. 24.1% of participants ( $N=121$ ) reported symptoms of depression equal to or greater than the clinical cut off point (13), indicating likely depression. This increased by 12.4% to 36.5% of the total sample ( $n=183$ ) when scores indicating possible depression (10-12) ( $n=62$ ) were included.

### ***Comorbid depression and posttraumatic stress***

Results of chi-square significance tests are reported in the journal article.

60 (12.0%) participants who reported clinically significant symptoms on the IES-R (according to total score) were also categorised as being depressed based on their EPDS scores, with a further 12 (2.4%) participants categorised as having possible depression. 23 (4.6%) participants who reported clinically significant symptoms on the total IES-R reported low levels of depression. For the subscales, a total of 86 participants (17.2%) reported medium ( $n=46$ , 9.2%) or high ( $n=40$ , 8%) levels of intrusion symptoms and were categorised as being depressed. 78 participants (15.6%) reported medium ( $n=39$ , 7.8%) or high ( $n=41$ , 8.2%) levels of avoidance symptoms and were categorised as depressed. A total of 67 participants (13.4%) reported medium ( $n=37$ , 7.4%) or high ( $n=31$ , 6.2%) levels of hyperarousal symptoms and were categorised as being depressed.

61 (12.2%) participants were categorised as being depressed (based on EPDS scores) but did not report clinically significant levels of traumatic stress, as measured by total IES-R. For the subscale symptoms of intrusion, avoidance and hyperarousal, 35 (7%), 41 (8.2%) and 53 (10.6%) of total participants were categorised as being depressed and reported low levels of traumatic stress, respectively.

### ***Maternal perceptions of mother-infant bond***

Total MPAS scores ranged from 36.31-95 with a mean of 78.64 ( $SD=10.23$ ). This indicated that on average, participants rated high levels of attachment to their infants.

### **Correlations between infant and maternal age and dependent variables**

Pearson's correlations were carried out for infant age and maternal age and the dependent variables (IES-R total, Intrusion, Avoidance & Hyperarousal; EPDS; MPAS total, Quality of Attachment, Pleasure in Interaction & Absence of Hostility).

#### ***Infant age***

The only significant correlation found between infant age and the dependent variables was a small negative correlation between infant age and symptoms of intrusion ( $r = -.10$ ,  $n = 502$ ,  $p < .05$ ). No significant correlations were found between the remaining total scales or subscales of the IES-R EPDS or MPAS ( $p > .05$ ).

#### ***Maternal age***

Correlational analysis revealed a small negative correlation between maternal age and symptoms of intrusion ( $r = -.155$ ,  $p < .001$ ), indicating that reported symptoms of intrusion decreased with maternal age. Significant correlations of small magnitude were also found between maternal age and IES-R total ( $r = -.126$ ,  $p < .01$ ) and IES-R Hyperarousal ( $r = -.102$ ,  $p < .05$ ). In addition a small negative correlation was found between maternal age and maternal perceptions of the mother infant bond, as measured by MPAS PI ( $r = -.159$ ,  $p < .001$ ). There were also small but significant negative correlations between maternal age and MPAS total ( $r = -.131$ ,  $p < .01$ ) and MPAS AH ( $r = -.116$ ,  $p < .001$ ). No significant correlations were found between maternal age and the remaining total and subscale scores of the IES-R, EPDS and MPAS ( $p > .05$ ).

### **Postnatal psychological outcomes by obstetric variables**

A series of between-groups analyses assessed differences in posttraumatic stress and depression symptomatology across categories for each obstetric variable. Parametric tests for between-group analyses assume homogeneity of variance. Levene's test for homogeneity was used to assess whether this assumption was met. A significant value ( $p < .05$ ) indicates

that this assumption has been violated. When equal variances were found, either a  $t$  test for independent samples or a one-way between groups Analysis of Variance (ANOVA) was used, depending on whether they were dichotomous or multichotomous variables. When the assumption was violated and the groups were of approximately equal size, these tests were utilised and the statistic which does not assume equal variance was reported (Welch's  $t$ ). However, when the assumption was violated and groups were of unequal size then a non-parametric alternative was utilised, either Mann-Whitney U test for dichotomous variables or the Kruskal-Wallis test for multichotomous variables.

### ***Mode of Delivery***

For data categorised according to mode of delivery Levene's homogeneity of variance assumption was violated ( $p < .05$ ). Due to unequal group sizes for categories of delivery modes, differences in postnatal psychological outcomes were explored using a Kruskal-Wallis test. There was a significant difference in levels of traumatic stress across the different categories of mode of delivery as measured by the total IES-R ( $\chi^2(4, n=502) = 57.64, p=.000$ ) and the subscales of Intrusion ( $\chi^2(4, n=502) = 76.55, p=.000$ ), Avoidance ( $\chi^2(4, n=502) = 82.151, p=.000$ ) and Hyperarousal ( $\chi^2(4, n=502) = 63.472, p=.000$ ). There was also significant difference between levels of depression ( $\chi^2(4, n=502) = 12.858, p=.012$ ).

Table 10 displays the means scores and standard deviation according to mode of delivery.

Table 10.Means and standard deviations for postnatal psychological outcomes according to mode of delivery

Postnatal psychological outcomes	Mode of delivery				
	Unassisted (n=203) Mean (SD)	Instrumental (n=128) Mean (SD)	EmCs (n=124) Mean (SD)	ElCs (n=24) Mean (SD)	Other (n=23) Mean (SD)
<b>IES-R total</b>	9.05 (12.74)	22.70 (18.45)	21.92 (19.92)	10.47 (11.83)	22.49 (17.73)
<b>Intrusion</b>	4.43 (5.44)	10.22 (7.85)	9.27 (8.18)	4.05 (4.56)	9.75 (7.45)
<b>Avoidance</b>	3.16 (4.96)	8.20 (7.15)	8.64 (7.87)	4.91 (6.15)	9.96 (8.00)
<b>Hyperarousal</b>	1.47 (3.56)	4.28 (5.23)	4.01 (5.45)	1.50 (2.34)	2.78 (4.25)
<b>EPDS</b>	7.71 (5.52)	9.76 (6.22)	8.87 (6.26)	6.66 (4.84)	9.63 (5.00)

### ***Gestational age***

For data categorised according to mode of delivery the homogeneity of variance assumption was met. Group differences were explored using an ANOVA. There was a significant difference in symptoms of avoidance across categories of gestational age ( $f= 2.76$  (3),  $p<.05$ ). For the remaining variables (IES total, intrusion & hyperarousal; and depression) differences in mean scores of the groups were not significant ( $p>.05$ ). Table 11 displays the means scores and standard deviation according to mode of delivery and ANOVA results.

Table 11: ANOVA test statistics, means and standard deviations for postnatal psychological outcomes according to gestational age

Postnatal psychological outcomes	Gestational age in weeks				Summary statistics		
	29-34 (n=12) Mean (SD)	35-37 (n=20) Mean (SD)	37-42 (n=413) Mean (SD)	Over 42 (n=55) Mean (SD)	<i>F</i>	<i>df</i>	<i>P</i>
<b>IES-R total</b>	23.40 (19.39)	20.89 (17.44)	15.46 (17.58)	19.90 (17.70)	2.17	3	.090
<b>Intrusion</b>	9.92 (7.98)	8.55 (7.07)	6.94 (7.38)	9.12 (7.35)	2.13	3	.095
<b>Avoidance</b>	9.23 (7.36)	8.96 (8.33)	5.78 (6.89)	7.35 (7.31)	2.76	3	.042
<b>Hyperarousal</b>	4.25 (5.15)	3.38 (4.00)	2.73 (4.69)	3.43 (4.44)	.813	3	.487
<b>EPDS</b>	10.30 (6.42)	8.73 (4.60)	8.44 (5.90)	9.13 (6.31)	.851	3	.628

### **Parity**

For data categorised according to parity, the homogeneity of variance assumption was violated ( $p < .05$ ). Due to unequal group sizes differences in postnatal psychological outcomes were explored using a Mann-Whitney test. There was a significant difference in posttraumatic stress levels between primiparous and multiparous women, as measured by the total IES-R ( $U=19079$ ,  $z = -4.41$ ,  $p = .000$ ,  $r = -.20$ ) and the subscales of Intrusion ( $U=18920$ ,  $z = -4.53$ ,  $p = .000$ ,  $r = -.20$ ), Avoidance ( $U=19360$ ,  $z = -4.25$ ,  $p = .000$ ,  $r = -.19$ ), and Hyperarousal ( $U=20746$ ,  $z = -3.43$ ,  $p = .001$ ,  $r = -.15$ ). Differences in levels of depression between groups were not significant ( $p > .05$ ). Table 12 displays the means scores and standard deviation according to parity

Table 12: Means and standard deviations for postnatal psychological outcomes according to parity

Postnatal psychological outcomes	Parity	
	Primiparous (n=358)	Multiparous (n=144)
	Mean (SD)	Mean (SD)
IES-R total	18.67 (18.76)	11.02 (13.347)
Intrusion	8.32 (7.77)	5.01 (5.80)
Avoidance	7.03 (7.43)	4.19 (5.53)
Hyperarousal	3.32 (4.98)	1.82 (3.50)
EPDS	8.74 (5.98)	8.19 (5.74)

### **Birth complications**

For data categorised according to birth complications, the homogeneity of variance assumption was violated ( $p < .05$ ). Due to the similarity in group size, independent t-tests were conducted, with Welch's  $t$  reported. There was a significant difference between posttraumatic stress scores for participants who experienced birth complications ( $n = 235$ ) compared to those who did not ( $n = 265$ ), as measured by the total IES-R ( $t = 10.28$  (456),  $p < .001$ ), Intrusion ( $t = 10.25$  (451),  $p < .001$ ), Avoidance ( $t = 9.21$  (451),  $p < .001$ ) and

Hyperarousal ( $t=8.32$  (421),  $p<.001$ ). There was also a significant difference in levels of depression ( $t=5.09$  (495),  $p<.001$ ). Results with means scores and standard deviations are displayed in Table 13.

Table 13: t-test statistics, means and standard deviations for postnatal psychological outcomes according to birth complication category

Postnatal psychological outcomes	Birth complications		Summary statistics		
	Yes	No			
	(n=265)	(n=235)			
	Mean (SD)	Mean (SD)	<i>T</i>	<i>Df</i>	<i>P</i>
<b>IES-R total</b>	23.26	8.75	10.28*	456	.000
<b>Intrusion</b>	10.19	4.14	10.25*	451	.000
<b>Avoidance</b>	8.70	3.40	9.21*	483	.000
<b>Hyperarousal</b>	4.37	5.33	8.32*	421	.000
<b>EPDS</b>	9.80	7.21	5.09*	495	.000

\*Assumption of equal variance violated: Welch's *t* reported.

### **Infant Hospitalisation**

For infant hospitalisation, Levene's test of homogeneity indicated that groups had an unequal homogeneity of variance ( $p<.05$ ). Due to the difference of group size a Mann-Whitney U test was conducted. There was a significant difference between levels of posttraumatic stress for those whose infants were hospitalised ( $n=134$ ) compared to infants who were not hospitalised ( $N=367$ ), as measured by the total IES-R ( $U=14903$ ,  $z=-10.08$ ,  $p=.000$ ,  $r= -.45$ ) and the subscales of Intrusion ( $U=15846$ ,  $z=-9.52$ ,  $p=.000$ ,  $r= -.43$ ), Avoidance, ( $U=15728$ ,  $z=-9.65$ ,  $p=.000$ ,  $r= -.43$ ), and Hyperarousal ( $U=17524$ ,  $z=-8.90$ ,  $p=.000$ ,  $r= -.40$ ). There was also a significant difference between the levels of depressions between these groups ( $U=19885$ ,  $z=-3.29$ ,  $p=.001$ ,  $r= -.15$ ). Table 14 displays the mean and standard deviations for postnatal psychological outcomes according to of infant hospitalisation category.



Table14: Means and standard deviations for postnatal psychological outcomes according to birth complication category

Postnatal psychological outcomes	Infant hospitalisation	
	Hospitalised (n=134)	Not hospitalised (n=367)
	Mean (SD)	Mean (SD)
<b>IES-R total</b>	22.45 (19.82)	14.05 (16.11)
<b>IES-R Intrusion</b>	9.41 (8.09)	6.50 (6.86)
<b>IES-R Avoidance</b>	8.87 (7.83)	5.19 (6.46)
<b>IES-R Hyperarousal</b>	4.17 (5.34)	2.36 (4.21)
<b>EPDS</b>	9.82 (5.91)	8.04 (5.76)

## **Part 3: Structural Equation Modelling**

### **Structural Equation Modelling: Method of Analysis**

#### ***Description of SEM***

SEM is a collection of statistical techniques which allow the examination of a set of relationships between one or more independent variables (IV) and one or more dependent variables (DV) (Tabachnick & Fidell, 2001). The analysis allows for the simultaneous testing of hypothesised directional and non-directional relationships amongst observed and unobserved latent variables. IVs and DVs can be either observed or latent variables.

Variables can be an IV and a DV within the same analysis.

A key aspect of SEM is the model or path diagram which specifies the theoretically hypothesised relationships between a set of IVs and DVs. Within a model, observed variables are represented by rectangles and latent variables (factors with two or more indicator variables) are represented by ovals. The relationships between variables are indicated by lines. The absence of a line between variables indicates no hypothesised direct relationship. A line with one arrow represents a hypothesised direct relationship between two variables with the variable the arrow is leaving, the IV. A line with an arrow at both ends indicates a correlation between the two variables with no implied direction of effect (Tabachnick & Fidell, 2001).

In addition to providing an estimation of predicted relationships, SEM aims to explain as much of variance of the dependent variables as possible within the specified model. SEM is assessed through 'goodness of fit', that is, how well the specified model fits the sample data.

#### ***Model fit indices***

The conventional method of assessing model fit is the Chi-Square ( $\chi^2$ ) statistic which should be non-significant in a model of good fit.  $\chi^2$  is an absolute fit index (Hu & Bentler, 1998;

Bentler, 2007) which determines how well a proposed model fits the sample data in comparison to no model at all. However, the use of chi-square has a number of limitations which can result in inaccurate probabilities of fit (Hooper et al., 2008) and potential rejection of a correctly specified model. For example, within large samples trivial differences between sample and estimated population covariance matrices are often significant (Tabachnick & Fidell, 2001). Therefore it is recommended to use several indices to assess model fit including absolute and incremental fit indices, the latter of which compare  $\chi^2$  to a null hypothesis baseline model in which all variables are uncorrelated. In addition, different fit indices reflect different aspects of model fit (Hooper et al, 2008). Of note, there is debate about which cut-off values represents a good fit.

Based on current recommendations (Bentler, 2007) the following fit indices were utilised: the Chi-square statistic, the root mean square of approximation (RMSEA) with 90% confidence intervals; the standardised root mean square (SRMR) and the Comparative Fit Index (CFI: Bentler, 1990). The RMSEA and SRMR are absolute fit indices. Current consensus is that the RMSEA value should be close to or less than .06 for a model to be considered of good fit (Hu & Bentler, 1999). In addition, the upper limit of the confidence interval should be less than .08 (Hooper et al., 2008). For the SRMR, values of less than .05 are considered a good fit (Bryne, 1998) with values up to .08 acceptable fit (Hu & Bentler, 1999). The Comparative Fit Index (CFI: Bentler, 1990) is an incremental fit index in which values range from 0.0-1.0, with those closer to 1.0 indicating good fit. A CFI value of greater than .95 is indicative of a model of good fit (Hu & Bentler, 1999).

### ***Analytic steps***

A two-step approach was used for data analysis (Anderson & Gerbing, 1998). The first step was a confirmatory factor analysis (CFA). A CFA model (also termed the measurement model) specifies the hypothesised relations of the observed variables to the underlying constructs (latent variables), with the constructs allowed to intercorrelate freely (Anderson &

Gerbing, 1998). The measurement model can be re-specified and re-estimated until it achieves a satisfactory fit to sample data. Once this is achieved, the second step is to examine the predicted structural model (SEM) by identifying paths between the latent and observed variables. Maximum Likelihood (ML) estimation was utilised for the measurement and structural model. The final structural model was bootstrapped to reduce the error of variance.

### ***Cross-validation***

A cross-validation technique was used to test the validity of structural model (Camstra & Boomsma, 1992). This involved splitting the sample data in half to create two separate samples. The first half was treated as a 'calibration' sample and the second half was used as a 'validation' sample. Once the model achieved a good fit with the calibration sample it was then tested on the validation sample. Model validity is supported if the model achieves a good fit with both samples.

## **Findings**

This section presents the model fit indices for the measurement model. Following this, results of hypotheses testing using SEM are presented. Finally, results for the nested structural models are presented. Results are presented for full sample data ( $n= 502$ ).

### **Model Fit – measurement models**

A CFA was undertaken on data from the full sample ( $n= 502$ ) to determine the fit of the proposed measurement model. The initial measurement model consisted of four latent variables {attachment experiences, metacognition, posttraumatic stress and maternal perceptions of the mother infant bond (mother-infant bond)} and thirteen observed variables {the sub-scales for the PBI, MCQ-30, IES-R and MPAS}. The only variable excluded from the initial measurement model was depression because the EPDS, a one factor measure was not an indicator for a latent variable.

Table 15 presents fit indices of the four factor measurement model (CFA 1). Whilst results indicated that this model was generally a good fit to data, the RMSEA value was out-with the recommended range.

Table15. Fit indices of alternative measurement models for full sample (n=502)

Description	$\chi^2$ , df	CFI	RMSEA	SRMR
4 factor measurement model (CFA 1)	182.431 (59), p=.0000	.968	.065 (.054-.075)	.041
3 factor measurement model (MPAS with 3 indicators ) (CFA 2)	50.371 (17) p=.0000	.982	.063 (.043-.083)	.034
3 factor measurement model (MPAS with 2 indicators (CFA 3)	23.698 (11) p=.0141	.992	.048 (.21-.75)	.017

### ***Measurement model modifications***

As reliability analysis had demonstrated unacceptable reliability values for the MCQ-30 subscales within this sample ( $\alpha < .70$ ), with one exception, a three factor measurement model was tested (CFA 2) which excluded the latent variable metacognition. The intention was that metacognition could instead be included in the structural model as an observed variable (measured by the total MCQ-30) rather than latent variable. Fit indices are displayed above in Table 15. This three factor model was an improved fit to the data. However the RMSEA value was still out-with what is considered to be a good fit and the upper confidence interval value was at the upper limit of acceptable.

On examination of indicator loadings and residual variances for model 2, it was noted that the observed variable Pleasure in Interaction (MPAS) had a lower loading on the latent variable mother- infant bond than the other indicators (.59 compared to .92 and .69 ) and a higher residual variance (.62 compared to .48 and .11). This variable was removed from the model in attempt to improve the fit of the measurement model. Fit indices are displayed in Table 15. The resulting model (CFA 3) was found to be an improved fit to the data according

to all fit indices and was therefore utilised for SEM. The table with latent constructs, indicators and loadings of the final measurement model (CFA 3) is presented in the journal article.

## **Model fit - Structural models**

### ***Hypotheses testing***

Prior to testing the full structural model hypotheses 1-3 were tested using SEM. Only the relevant variables were specified in the SEM for each hypothesis.

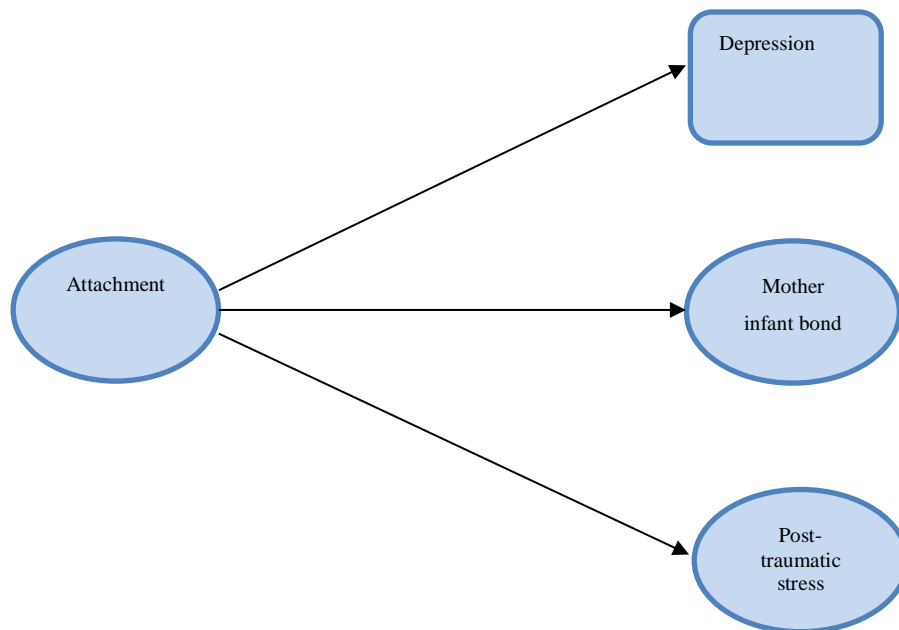
#### ***Hypothesis 1***

*Attachment experiences will be associated with postnatal psychological outcomes (1a) and will have a direct effect on maternal perceptions of the mother-infant bond (1b)*

For Hypothesis 1, a direct relationship was specified from attachment experiences to depression, posttraumatic stress and mother infant bond (illustrated in Figure 4). Aside from this, latent variables were free to correlate.

The model demonstrated a good fit to the data ( $n=502$ ):  $\chi^2(15)=39.342$ ,  $p=.0006$ , CFI= .988, RMSEA=.057 (.035-.079), SRMR=. 019. All specified paths were significant, providing support to Hypothesis 1 (a & b). Attachment had a medium direct effect upon depression ( $\beta=-.33$ ,  $p<.001$ ); and a small direct effect upon posttraumatic stress ( $\beta=-.25$ ,  $p<.001$ ) and the mother infant bond ( $\beta=.25$ ,  $p<.001$ ). In addition, there was a large correlation between depression and posttraumatic stress ( $\beta=.60$ ,  $p<.001$ ); and depression and mother infant bond ( $\beta=.687$ ,  $p<.001$ ), thus providing support to the two assumptions of the study. There was also a medium correlation between posttraumatic stress and mother-infant bond ( $\beta=-.42$ ,  $p<.001$ ), providing support that these variables are associated.

Figure 4: A path diagram of Hypothesis 1 (a & b)

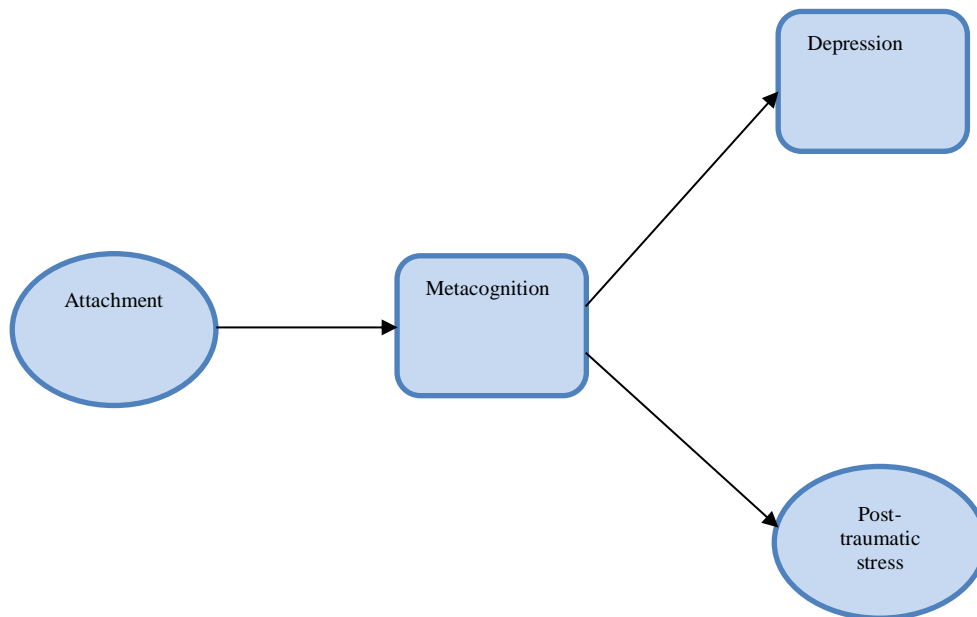


### *Hypothesis 2*

*Metacognition will mediate the relationship between attachment experiences and postnatal psychological outcomes*

For Hypothesis 2 the following direct relationships were specified: attachment experiences to metacognition; and from metacognition to posttraumatic stress and depression (illustrated in Figure 5). This represented a fully mediated model. Aside from these, latent variables were left free to correlate.

Figure 5: A path diagram of Hypothesis 2



The model demonstrated a good fit to the data according to most fit indices (n=502):  $\chi^2(12)=39.494$ ,  $p=.0001$ , CFI= .984, RMSEA=.068 (.045-.092), SRMR=. 026. However the RMSEA index was at the upper limit for what would be acceptable. All specified paths were significant, providing support to Hypothesis 2. Attachment had a medium effect upon metacognition ( $\beta= -.41$ ,  $p < .001$ ). Metacognition had a medium effect upon posttraumatic stress ( $\beta= .47$ ,  $p < .001$ ) and a large effect upon depression ( $\beta= .56$ ,  $p < .001$ ). Once again, a large correlation was found between depression and posttraumatic stress ( $\beta=.51$ ,  $p < .001$ ).

### *Hypothesis 3:*

*Postnatal symptoms of posttraumatic stress will have a direct effect on maternal perceptions of the mother-infant bond, independent of the effect of depression.*

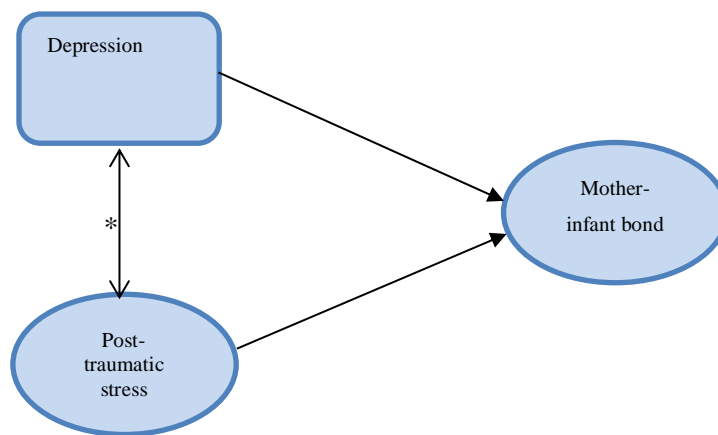
For Hypothesis 3 the mother infant bond was regressed upon depression and posttraumatic stress (illustrated in Figure 6). This model was a poor fit to the data (n=502):  $\chi^2(7)=35.797$ ,  $p=.0000$ , CFI= .868, RMSEA=.251 (.225-.278), SRMR=. 026. However when a correlation



was specified between posttraumatic stress and depression this improved the fit considerably (n=502):  $\chi^2(8)=261.148$ ,  $p=.0000$ , CFI= .985, RMSEA=.091 (.062-.121), SRMR=. 022.

Within this model, the path from posttraumatic stress to mother infant bond was not significant and was of neglectable size ( $\beta = -.01$ ,  $p = .788$ ). Depression had a large effect on the mother infant bond ( $\beta = .71$ ,  $p < .001$ ). There was a large correlation between posttraumatic stress and depression ( $\beta = .63$ ,  $p < .001$ ). Contrary to expectations, findings indicated that posttraumatic stress did not have a direct effect upon the mother-infant bond.

Figure 6: A path diagram of Hypothesis 3



\*This path was added to improve model fit

### ***Nested structural models***

A series of 5 a priori nested models were constructed driven by the study hypotheses.

Pathways within these models were based upon the hypotheses and theoretical assumptions.

The paths of model 1 were specified as follows: the relationship between attachment and postnatal psychological outcomes was fully mediated by metacognition. Depression had a direct effect upon the mother-infant bond. Posttraumatic stress had a direct effect upon depression but no direct effect upon the mother infant bond. Model 2 was specified in the same manner with an additional path from attachment experiences to the mother infant bond. Model 3 was a partially mediated model with two direct paths specified between attachment

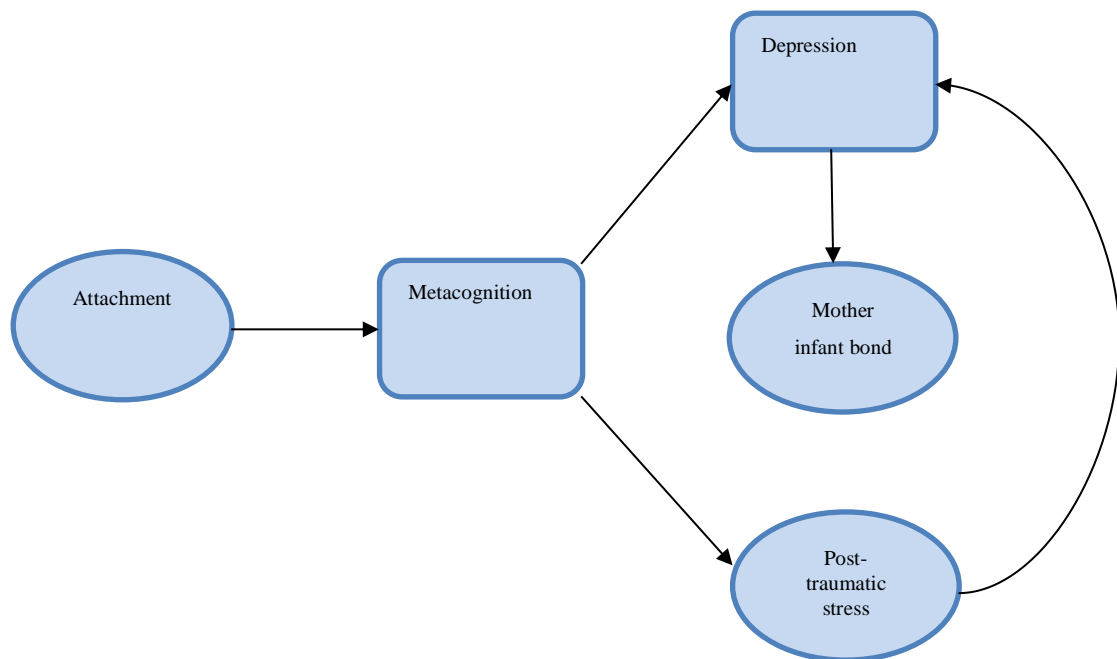
experiences and depression, and attachment experiences and posttraumatic stress. The direct effect of attachment experiences to mother infant bond was removed.

Model 4 added a direct effect from posttraumatic stress to the mother-infant bond to the partially mediated model and a direct path from attachment experiences to the mother infant bond. Model 5 tested the fully mediated model of metacognition (model 1) with a direct effect between posttraumatic stress and the mother infant bond specified.

#### *Model 1*

Model 1 is illustrated schematically in Figure 7.

Figure 7: Structural model 1 with full mediation of attachment by metacognition

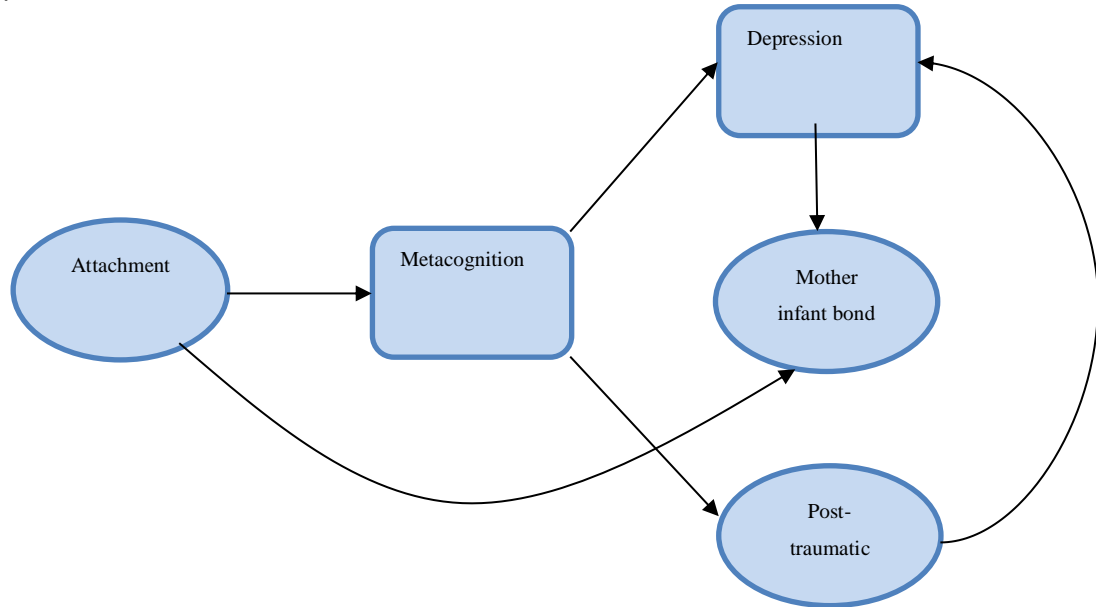


This model was a good fit to the data ( $n=502$ ):  $\chi^2(24)= 54.173$ ,  $p=.0004$ , CFI= .987, RMSEA=.05 (.032-.068), SRMR=. 031. The estimated parameters for all direct paths within this model were significant ( $p<.001$ ). It explained the following proportions of variances: 16.4 % of metacognition, 22.0 % of posttraumatic stress, 48.7 % of depression and 50.5 % of maternal perceptions of the mother infant bond.

### Model 2

Model 2 is displayed in Figure 8.

Figure 8: Structural model 2 with full mediation of attachment by metacognition plus a direct path from attachment to mother-infant bond

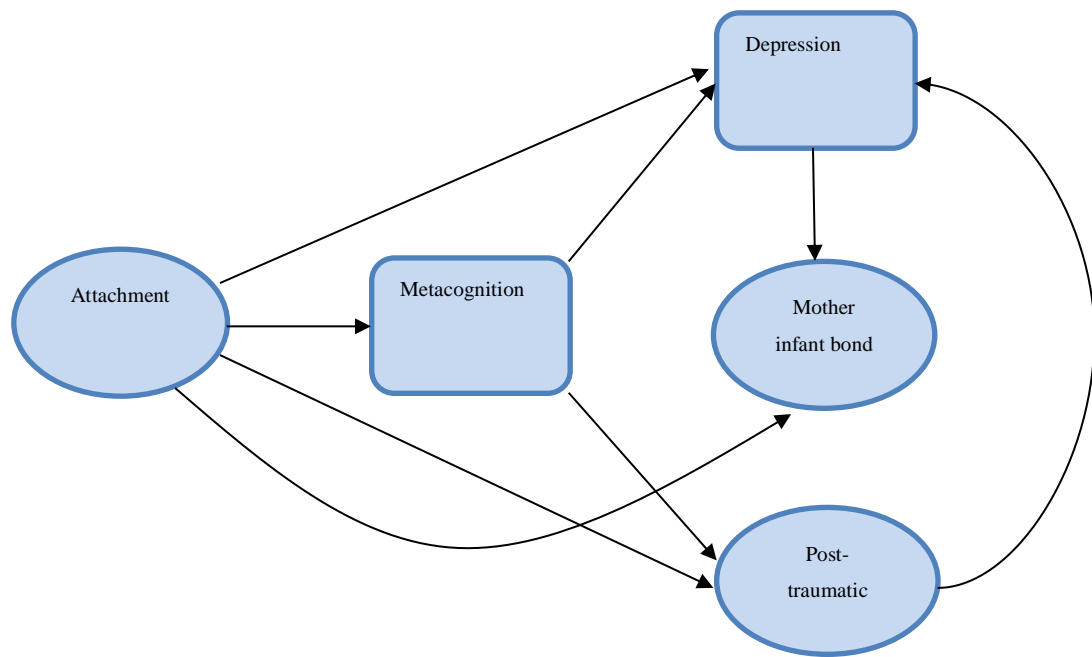


Model 2 was also a good fit to the data ( $n=502$ ):  $\chi^2(23)= 53.089$ ,  $p=.0004$ , CFI= .987, RMSEA=.051 (.033-.069), SRMR=. 027. It was not a significantly better fit than Model 1-3, as measured by changes in  $\chi^2$  ( $p>.05$ ). However on examination of estimated parameters the direct path specified from attachment experiences to mother-infant bond was not significant ( $\beta=-.083$ ,  $p =.098$ ). The remaining parameters for all direct paths within this model were significant ( $p<.001$ ). This model explained the following proportions of variances: 17.1 % of metacognition, 22.0 % of posttraumatic stress, 48.7 % of depression and 50.6 % of maternal perceptions of the mother infant bond.

### Model 3

Model 3 is illustrated in Figure 9.

Figure 9: Structural Model 3 with a partially mediated path between attachment and postnatal outcomes

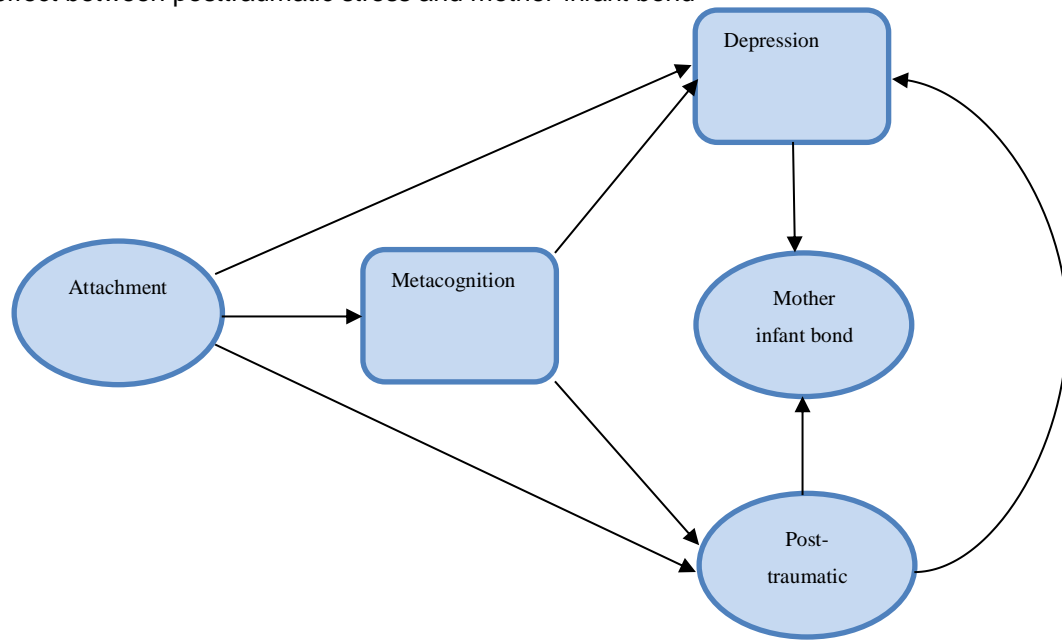


Model 3 was also a good fit to the data ( $n=502$ )  $\chi^2(22) = 50.37$ ,  $p = .0005$ , CFI=.987, RMSEA=. 51 (.000-.069), SRMR=.025. On examination of estimated parameters the direct path specified from attachment experiences to posttraumatic stress was non-significant ( $\beta = -.06$ ,  $p = .359$ ). Similarly, the direct path from attachment experiences to depression was non-significant ( $\beta = -.083$ ,  $p = .098$ ). This model explained the following proportions of variances: 17.2% of metacognition, 22.3% of posttraumatic stress, 49.3% of depression and 50.8% of maternal perceptions of the mother infant bond.

#### *Model 4*

Model 4 is illustrated in Figure 10.

Figure 10: Structural Model 4 with partial mediation of attachment experiences and a direct effect between posttraumatic stress and mother-infant bond

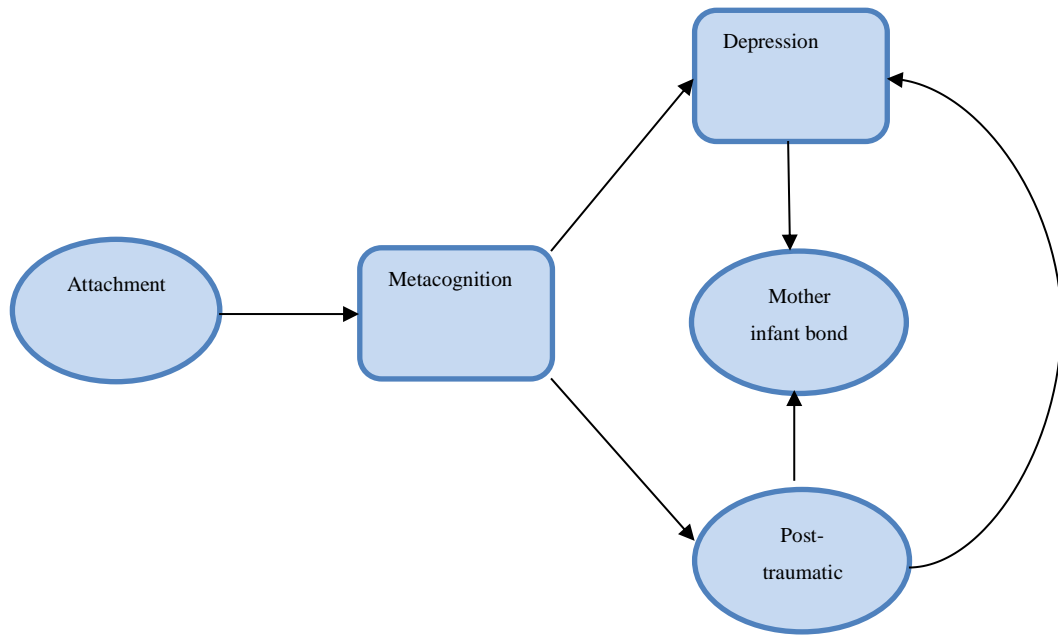


This model was also a good fit to the data ( $n=502$ )  $\chi^2(21) = 50.25$ ,  $p = .0003$ , CFI=.987, RMSEA=. 53 (.000-.069), SRMR=.025. However it was not a significantly better fit than Model 1-3, as measured by changes in  $\chi^2$  ( $p > .05$ ). Estimated parameters revealed that the direct paths specified from attachment experiences to posttraumatic stress ( $\beta = -.06$ ,  $p = .357$ ) and depression were non-significant ( $\beta = -.083$ ,  $p = .098$ ). The direct path specified from posttraumatic stress to the mother infant bond was also non-significant ( $\beta = -.018$ ,  $p = .733$ ). This model explained the following proportions of variances: 16.6% of metacognition, 22.3% of posttraumatic stress, 49.3% of depression and 50.5% of maternal perceptions of the mother infant bond.

#### *Model 5*

Figure 11 displays Model 5.

Figure 11: Structural model 5, a fully mediated model via metacognition with direct effect between posttraumatic stress and mother-infant bond



This model was also a good fit to the data ( $n=502$ )  $\chi^2(23) = 54.057$ ,  $p = .0003$ , CFI=.987, RMSEA=. 52 (.034-.070), SRMR=.031. Model 5 was not a significantly better fit than the previous models as measured by changes in  $\chi^2$  ( $p > .05$ ).

Within this model the direct path specified from posttraumatic stress to the mother infant bond was non-significant ( $\beta = -.018$ ,  $p = .733$ ). All other paths were significant. This model explained the following proportions of variances: 16.4% of metacognition, 22.0% of posttraumatic stress, 48.7% of depression and 50.5% of maternal perceptions of the mother infant bond.

#### *Summary of nested model findings*

Table 16 displays the fit indices of nested models 1-5. Comparison of the fit indices revealed little variation across the five models. Due to the finding that there were non-significant paths in models 2-5 it was decided to retain Model 1: the fully mediated model. This was also the most parsimonious model.

Table 16: SEM nested model fit indices for full sample (n=502)

Model	Chi-sq, df	Significant difference in Chi-square	CFI	RMSEA	SRMR
SEM model 1	54.173 (24)	N.A	.987	.050	.031
SEM model 2	53.087 (23)	No	.987	.051	.027
SEM model 3	49.456 (21)	No	.987	.052	.023
SEM model 4	50.25 (21)	No	.987	.053	.024
SEM model 5	54.057 (23)	No	.986	.052	.031

### *Secondary analyses*

Based upon conceptual similarities between metacognition, mentalization and reflective functioning, a direct path was added to Model 1 from metacognition to the mother-infant bond as an exploratory step. The resulting model was found to be an improved fit to the data (n=502)  $\chi^2(23) = 45.448$ ,  $p = .0035$ , CFI=.99, RMSEA=.44 (.025-.063), SRMR=.026. The change in  $\chi^2$  was significant ( $\chi^2(1) = 8.725$ ,  $p < .01$ ). Therefore this model was therefore selected for final SEM analyses.

### ***Final Structural Model***

The final model was specified as described above. In addition to the direct paths, four indirect effects were specified from: attachment experiences to posttraumatic stress via metacognition; attachment to depression via metacognition; attachment experiences to mother-infant bond via metacognition; and, posttraumatic stress to mother-infant bond via depression. In order to reduce the error of variance, data for the final model was bootstrapped to provide data for 1000 cases. The final structural model with estimated parameter values for the whole sample is illustrated in Figure 3 (journal article).

The relations and regression coefficients were as follows. There was a medium negative effect from attachment experiences to metacognition ( $\beta = -.41$ ). Metacognition had a medium direct effect upon depression ( $\beta = .34$ ) and posttraumatic stress ( $\beta = .47$ ) and a small negative direct effect upon maternal perceptions of the mother-infant-bond ( $\beta = -.13$ ).

Posttraumatic stress had a medium direct effect on depression ( $\beta = .48$ ). Depression had a large negative direct effect on maternal perceptions of the mother –infant bond ( $\beta = -.64$ ).

Attachment experiences had a small negative indirect effect upon posttraumatic stress via metacognition ( $\beta = -.19$ ); and upon depression via metacognition ( $\beta = -.14$ ). An indirect path was now specified between attachment experiences and the mother infant bond, fully mediated by metacognition. However the indirect effect was of negligible size ( $\beta = -.054$ ).

Posttraumatic stress had a medium indirect effect upon the mother-infant bond, mediated by depression ( $\beta = -.30$ ). The final model explained 16.4% of the variance of metacognition, 22.0% of the variance in posttraumatic stress, 48.7% of the variance of depression and 51.9% of the variance of maternal perceptions of the mother infant bond.

#### *Model validation*

Fit indices for the calibration and validation samples are shown in Table 18. These indicated that the model was a good fit with both samples. This provided support for the validity of the final model.

Table 18: Fit indices for final model for validation and calibration sample

	Chi-square (df=23)	CFI	RMSEA & CI (90%)	SRMR
<b>Calibration half (n=231)</b>	$\chi^2=26.43$ ; $p=.281$	.996	.025 (.0-.062)	.027
<b>Validation half (n=271)</b>	$\chi^2= 37.044$ ; $p=.032$	.989	.047 (.14-.75)	.039



## ADDITIONAL DISCUSSION

### **Attachment, metacognition and postnatal psychological outcomes**

As predicted, attachment experiences were associated with postnatal psychological outcomes within this study. Attachment experiences had a small indirect effect upon postnatal psychological outcomes, mediated by metacognition, providing support to hypothesis 1a and 3. As noted, results indicate that parenting experiences in childhood have consequences upon postnatal psychological wellbeing and this corresponds with parenting research (Enns *et al.*, 2002; Lizardi *et al.*, 1995; Mahedy *et al.*, 2011; Parker *et al.*, 1987). More broadly, results are consistent with attachment theory (Bowlby, 1969) which proposes that an individual's attachment representations, which develop within the context of early attachment relationships, constitute risk or protection from emotional disorder. This also corresponds to the conceptualisation of the attachment system as an emotional regulation device (Mikulincer & Shaver, 2007).

Attachment experiences were statistically predictive of metacognition, via a medium effect and accounted for 14% of its variance. This finding provides strong support that metacognitive beliefs and strategies may develop within the context of attachment relationships and is broadly consistent with psychological theories such as cognitive theory (Beck, 1979) and social learning theory (Bandura, 1977) which propose that beliefs and coping strategies are shaped by parenting experiences. It is possible that the association may be partially attributed to the conceptual similarities between metacognition, mentalization and reflective functioning, linked via their association with theory of mind. Therefore it may reflect one of these unmeasured constructs. Whilst mentalization and reflective functioning are distinct from metacognition, all three have a cognitive component associated with affect regulation. As noted, mentalization, RF and affect regulation develop within the context of

early attachment relationships and therefore may plausibly account for the association between attachment experiences and metacognition.

As anticipated metacognition directly predicted symptoms of depression and posttraumatic stress, and mediated the effect of attachment experiences upon these outcomes. This indicates that attachment experiences are associated with the development of metacognitive beliefs and strategies, which in turn are associated with the development and/or maintenance of emotional distress. The association between metacognition and postnatal psychological outcomes is consistent with metacognitive theory of psychological disorder (Wells, 2009) and related research which implicates the role of metacognition in the development and maintenance of depression (Papageorgio & Wells, 2000; Yilmaz *et al.*, 2011) and posttraumatic stress (Bennet & Wells, 2010; Wells & Colbear, 2012; Wells & Sembi, 2004). The medium effect between metacognition and both outcome variables provides strong support for the role of metacognition in the experience of postnatal emotional distress. Within this study it was not clear whether metacognitive beliefs and strategies were a pre-existing vulnerability to psychopathology or if they developed in response to symptoms, or both. However, the direct association between attachment experiences and metacognition provides some evidence for the former. This could indicate that metacognitive beliefs or strategies may be a relatively stable, thereby associating it with attachment theory, emotional regulation and reflective functioning. Whilst not directly investigated in this study, metacognition may have an important role in accounting for the associations between posttraumatic stress and depression symptoms. For example, beliefs about significance of trauma symptoms may influence the use of metacognitive strategies used to regulate emotions and influence mood.

### **Attachment experiences, metacognition and the mother-infant bond**

Based on attachment theory it was predicted that attachment experiences would be associated with maternal perceptions of the mother-infant bond. When Hypotheses 1 was

tested individually, attachment experiences had a small direct effect upon the mother-infant bond. However when this was tested within the nested models which specified various predicted relationships, the direct effect between attachment experiences and the mother-infant bond was statistically insignificant. Therefore the final model did not include this path. Instead, within the final model metacognition fully mediated the effect of attachment experiences upon the mother-infant bond. Of note, this indirect effect size was of negligible size. These finding was surprising in light of the large volume of empirical evidence in support for the intergenerational transmission of attachment (van Ijzendoorn *et al.*, 1992; van Ijzendoorn, 1995). As previously discussed this is likely to be related to the constructs measured within this study and limitations associated with self-report instruments.

The fit of the structural model was significantly improved with the addition of a direct path from metacognition and the mother-infant bond. A small direct effect was found between these variables. Based upon the conceptual similarities between the constructs of mentalization, reflective functioning and metacognition, these findings could be considered to constitute support for the predictive role of reflective functioning or maternal reflective functioning in the developing mother-infant relationship. This is consistent with findings that maternal reflective functioning is associated with both maternal attachment representations and infant attachment style (Slade *et al.*, 2005); and mother-infant affective communication and infant attachment style (Grienberger *et al.*, 2005) and therefore may play a vital role in the intergenerational transmission of attachment.

### **Posttraumatic stress, depression and maternal perceptions of the mother-infant bond**

This study contributes to previous research investigating the nature of the relationship between posttraumatic stress, depression and mother-infant relationship outcomes. As noted, posttraumatic stress did not independently predict perceptions of the mother-infant bond. This study had a large sample size and there was relatively high prevalence of posttraumatic

stress and depression in comparison to previous studies. In addition the method of analysis permitted mediational analysis which has not previously been reported on within published research. Findings provide further support to the argument that posttraumatic stress symptoms may not directly influence the mother-infant relationship within the first postnatal year.

## **Postnatal psychological outcomes**

### **Posttraumatic stress**

Within this study prevalence rates for clinically significant levels of posttraumatic stress and depression were high in comparison to previous studies (e.g. Cigoli *et al.*, 2006; Czarnocka & Slade, 2000; Soet *et al.*, 2003). This corresponds with previous indications that internet samples over represent symptomatic women (Ayers *et al.*, 2009). However, this study aimed to recruit mothers who had experienced difficult or traumatic births by targeting several websites likely to be accessed by this population, thereby increasing the likelihood of sampling this population. It is also likely that individuals with difficult or traumatic birth experiences were particularly motivated to participate due to personal interest. The obstetric characteristics of the sample provide some support for this, with a higher proportion of reported assisted deliveries compared to national statistics and elevated rates of birth complications and infant hospitalisation. A further issue which may have contributed towards a highly symptomatic sample was that approximately 70% of the sample were primiparas. Research indicates that primiparous mothers report higher rates of posttraumatic stress compared to multiparous mothers (Ayers *et al.*, 2009; Wijma *et al.*, 1997). The comparatively high response from primiparas is likely to relate to their time availability in comparison to multiparas. Levels of traumatic stress and depression differed across most categories of obstetric variables indicating that these factors were associated with psychological distress.

The choice of PTSD outcome measure has been found to influence reported prevalence rates (Stramrood *et al.*, 2010). In addition, the IES-R does not have specific clinical cut-off rates for subscales or for the total scale. Within this study the clinical cut off recommended for IAPT was used for the total score. For the subscales this was calculated according to the original IES. As there is no hyperarousal scale in the original measure, the cut of score for Intrusion was applied, potentially resulting in inaccurate prevalence rates. Importantly, this did not affect the main analysis in which posttraumatic stress was analysed as a continuous variable.

This study sampled from mothers with infants in their first postnatal year rather than at a specific time point. As symptoms of intrusion and avoidance are considered to constitute an ordinary adaptive process following a traumatic event, it is possible that infant age may have been associated with posttraumatic stress. The small but significant correlation between infant age and symptoms of intrusion corresponds with this. However this was a small correlation ( $r = -.10$ ) and infant age was not correlated with the other subscales or total score. It is likely that for a proportion of participants, posttraumatic symptoms may have constituted a normal adaptive process to a traumatic event or experiences associated with parenting an infant such as sleeping difficulties and associated irritability. However, for others symptoms were likely to represent clinically significant distress which may not reduce over time. Results indicate that those with elevated symptoms appear to be more vulnerable to experiencing associated low mood and potential disruption to the developing mother-infant relationship.

### **Depression**

Approximately a quarter of participants reported clinically significant depression, constituting a higher prevalence than the 13-19% indicated by meta-analyses (Gavin *et al.*, 2005; O-Hara & Swain, 1996). These results are interesting considering that demographic variables indicated that the sample may have been of higher socioeconomic status, as

elevated depression levels are associated with lower socioeconomic status (Lorant *et al.*, 2003; 2007). Elevated prevalence of depression is likely to be attributed to similar reasons as those previously outlined in relation to posttraumatic stress. Another important determining factor may be the high prevalence of posttraumatic stress which may have precipitated or compounded depressive symptomatology for participants, with the potential role of metacognition in this relationship already noted. Indeed, levels of depressive symptomatology varied across categories for several obstetric factors indicating that these were either directly associated with depression or indirectly, via posttraumatic symptomatology. A further possible explanation is that the use of an internet methodology may have increased participant's perception of anonymity which in turn may have reduced a social desirability bias within the self-report measure, resulting in increased honesty in reporting of symptoms and elevated prevalence rates.

## **Limitations**

As noted, findings should be interpreted within the context of a number of shortcomings and broader limitations. Perhaps most importantly, it is not possible to conclude whether symptoms of posttraumatic stress developed in direct relation to childbirth. There is some support that a proportion of participants did, as there was a significant difference between levels of posttraumatic stress according to reported birth complications. Participants were instructed to complete the IES-R in relation to their recent birth. However it is possible that identified symptoms related to previous or more recent events such as those during pregnancy or infant hospitalisation. Whilst baseline posttraumatic stress symptoms could not be assessed in late pregnancy due to the cross-sectional design, it would have been possible to include questionnaire items regarding previous traumatic events and mental health history, particularly episodes of depression, anxiety and posttraumatic stress. However, it could not be assumed that objectively traumatic events would result in posttraumatic stress or that participants would correctly identify previous mental health

symptomatology. The level of interest in participation had not been anticipated and therefore care was taken to minimise participant burden in order to maximise recruitment. Related to this, only the maternal version of the PBI was utilised within the study, based on the assumption that the mother was the primary attachment figure. In addition to this assumption potentially being inaccurate for a proportion of the sample, this excluded the important influence of paternal attachment experiences. Of further note, it was not possible to randomise the order of measure administration which could have resulted in order effects.

A second issue relates to the internet based sampling strategy. Whilst this was appropriate for the study hypotheses in terms of accessing participants with elevated levels of posttraumatic stress and depression, this may have limited the generalisability of finding and possibly introduced a self-selection bias (Rhodes *et al.*, 2003; Stanton, 1998; Thomson *et al.*, 2003; Wright, 2005). In addition, the cross-sectional design limited several aspects of the study. Data did not capture earlier within-participant experience of posttraumatic stress or depressive symptomatology since birth. However, the large sample minimises the influence of this. A further caveat is that whilst statistically predictive relations between variables were found, conclusions regarding their temporal relations and genuinely predictability cannot be assumed. One exception to this may be attachment experiences. As the PBI measured experiences of parenting within the first sixteen years of life temporal relations could be assumed. All data was based upon participant self-report and therefore provides subjective accounts of attachment experiences, metacognition, mental health symptomatology and perceptions of the mother-infant bond. These are not equivalent to clinical assessment of psychopathology and assess different constructs to in-depth interviews or observer-rated attachment –related assessments. It is also possible that participant retrospective reports of parenting may have been subject to inaccuracies, however the chance of this is minimal as the PBI has demonstrated stability over a 20 year period (Murphy *et al.*, 2010; Wilhelm *et al.*, 2005).

## Conclusions

Findings contribute to research by modelling estimated interactions between a mother's attachment experiences, metacognition, postnatal psychological outcomes and mother-infant relationship outcomes. Metacognition may have a key role in the development and maintenance of postnatal depression and posttraumatic stress. There is strong support that metacognitive therapy may be an appropriate treatment approach for these postnatal psychological disorders. Results indicate that postnatal symptoms of traumatic stress may not directly influence the mother-infant bond but are strongly associated with depression, which has an established negative effect upon mother-infant relationship outcomes. Birth experiences should routinely be explored alongside postnatal depression screening. If probable depression or difficult birth experiences are identified, symptoms of posttraumatic stress should be enquired about and screened for in order to minimise potential adverse consequences and enable timely intervention.



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## APPENDICES

## Appendix 1: Author guidelines for Clinical Psychology Review

### Article structure

Manuscripts should be prepared according to the guidelines set forth in the Publication Manual of the American Psychological Association (6th ed., 2009).

Manuscripts should ordinarily not exceed 50 pages. Exceptions may be made with prior approval of the Editor in Chief for manuscripts including extensive tabular or graphic material, or appendices.

### Appendices

If there is more than one appendix, they should be identified as A, B, etc. Formulae and equations in appendices should be given separate numbering: Eq. (A.1), Eq. (A.2), etc.; in a subsequent appendix, Eq. (B.1) and so on. Similarly for tables and figures: Table A.1; Fig. A.1, etc.

### Essential title page information

Title. Concise and informative. Titles are often used in information-retrieval systems. Avoid abbreviations and formulae where possible. **Note: The title page should be the first page of the manuscript document indicating the author's names and affiliations and the corresponding author's complete contact information.**

*Author names and affiliations.* Where the family name may be ambiguous (e.g., a double name), please indicate this clearly. Present the authors' affiliation addresses (where the actual work was done) below the names. Indicate all affiliations with a lower-case superscript letter immediately after the author's name and in front of the appropriate address. Provide the full postal address of each affiliation, including the country name, and, if available, the e-mail address of each author within the cover letter.

*Corresponding author.* Clearly indicate who is willing to handle correspondence at all stages of refereeing and publication, also post-publication. **Ensure that telephone and fax numbers (with country and area code) are provided in addition to the e-mail address and the complete postal address.**

*Present/permanent address.* If an author has moved since the work described in the article was done, or was visiting at the time, a "Present address" (or "Permanent address") may be indicated as a footnote to that author's name. The address at which the author actually did the work must be retained as the main, affiliation address. Superscript Arabic numerals are used for such footnotes.

### Abstract


A concise and factual abstract is required (not exceeding 200 words). This should be typed on a separate page following the title page. The abstract should state briefly the purpose of the research, the principal results and major conclusions. An abstract is often presented separate from the article, so it must be able to stand alone. References should therefore be avoided, but if essential, they must be cited in full, without reference to the reference list.

### Graphical abstract

A Graphical abstract is optional and should summarize the contents of the article in a concise, pictorial form designed to capture the attention of a wide readership online. Authors must provide images that clearly represent the work described in the article. Graphical abstracts should be submitted as a separate file in the online submission system. Image size: Please provide an image with a minimum of 531 × 1328 pixels (h × w) or proportionally more. The image should be readable at a size of 5 × 13 cm using a regular screen resolution of 96 dpi.

Preferred file types: TIFF, EPS, PDF or MS Office files.

See <http://www.elsevier.com/graphicalabstracts> for examples.

Authors can make use of Elsevier's Illustration and Enhancement service to ensure the best presentation of their images also in accordance with all technical requirements:  *Illustration Service*.

## Highlights

Highlights are mandatory for this journal. They consist of a short collection of bullet points that convey the core findings of the article and should be submitted in a separate file in the online submission system. Please use 'Highlights' in the file name and include 3 to 5 bullet points (maximum 85 characters, including spaces, per bullet point).

See <http://www.elsevier.com/highlights> for examples.

## Keywords

Immediately after the abstract, provide a maximum of 6 keywords, using American spelling and avoiding general and plural terms and multiple concepts (avoid, for example, 'and', 'of'). Be sparing with abbreviations: only abbreviations firmly established in the field may be eligible. These keywords will be used for indexing purposes.

## Abbreviations

Define abbreviations that are not standard in this field in a footnote to be placed on the first page of the article. Such abbreviations that are unavoidable in the abstract must be defined at their first mention there, as well as in the footnote. Ensure consistency of abbreviations throughout the article.

## Acknowledgements

Collate acknowledgements in a separate section at the end of the article before the references and do not, therefore, include them on the title page, as a footnote to the title or otherwise. List here those individuals who provided help during the research (e.g., providing language help, writing assistance or proof reading the article, etc.).

## Footnotes

Footnotes should be used sparingly. Number them consecutively throughout the article, using superscript Arabic numbers. Many wordprocessors build footnotes into the text, and this feature may be used. Should this not be the case, indicate the position of footnotes in the text and present the footnotes themselves separately at the end of the article. Do not include footnotes in the Reference list.

### *Table footnotes*

Indicate each footnote in a table with a superscript lowercase letter.

## **Electronic artwork**

### *General points*

- Make sure you use uniform lettering and sizing of your original artwork.
- Save text in illustrations as 'graphics' or enclose the font.
- Only use the following fonts in your illustrations: Arial, Courier, Times, Symbol.
- Number the illustrations according to their sequence in the text.
- Use a logical naming convention for your artwork files.
- Provide captions to illustrations separately.
- Produce images near to the desired size of the printed version.
- Submit each figure as a separate file.

A detailed guide on electronic artwork is available on our website:

<http://www.elsevier.com/artworkinstructions>

**You are urged to visit this site; some excerpts from the detailed information are given here.**

### *Formats*

Regardless of the application used, when your electronic artwork is finalised, please 'save as' or convert the images to one of the following formats (note the resolution requirements for line drawings, halftones, and line/halftone combinations given below):

EPS: Vector drawings. Embed the font or save the text as 'graphics'.

TIFF: Color or grayscale photographs (halftones): always use a minimum of 300 dpi.

TIFF: Bitmapped line drawings: use a minimum of 1000 dpi.

TIFF: Combinations bitmapped line/half-tone (color or grayscale): a minimum of 500 dpi is required.

If your electronic artwork is created in a Microsoft Office application (Word, PowerPoint, Excel) then please supply 'as is'.

**Please do not:**

- Supply files that are optimised for screen use (e.g., GIF, BMP, PICT, WPG); the resolution is too low;
- Supply files that are too low in resolution;
- Submit graphics that are disproportionately large for the content.

**Color artwork**

Please make sure that artwork files are in an acceptable format (TIFF, EPS or MS Office files) and with the correct resolution. If, together with your accepted article, you submit usable color figures then Elsevier will ensure, at no additional charge, that these figures will appear in color on the Web (e.g., ScienceDirect and other sites) regardless of whether or not these illustrations are reproduced in color in the printed version. **For color reproduction in print, you will receive information regarding the costs from Elsevier after receipt of your accepted article.** Please indicate your preference for color: in print or on the Web only. For further information on the preparation of electronic artwork, please see <http://www.elsevier.com/artworkinstructions>.

Please note: Because of technical complications which can arise by converting color figures to 'gray scale' (for the printed version should you not opt for color in print) please submit in addition usable black and white versions of all the color illustrations.

**Figure captions**

Ensure that each illustration has a caption. Supply captions separately, not attached to the figure. A caption should comprise a brief title (**not** on the figure itself) and a description of the illustration. Keep text in the illustrations themselves to a minimum but explain all symbols and abbreviations used.

**Tables**

Number tables consecutively in accordance with their appearance in the text. Place footnotes to tables below the table body and indicate them with superscript lowercase letters. Avoid vertical rules. Be sparing in the use of tables and ensure that the data presented in tables do not duplicate results described elsewhere in the article.

**References**

Citations in the text should follow the referencing style used by the American Psychological Association. You are referred to the Publication Manual of the American Psychological Association, Sixth Edition, ISBN 1-4338-0559-6, copies of which may be ordered from <http://books.apa.org/books.cfm?id=4200067> or APA Order Dept., P.O.B. 2710, Hyattsville, MD 20784, USA or APA, 3 Henrietta Street, London, WC3E 8LU, UK. Details concerning this referencing style can also be found at <http://humanities.byu.edu/linguistics/Henrichsen/APA/APA01.html>

**Citation in text**

Please ensure that every reference cited in the text is also present in the reference list (and vice versa). Any references cited in the abstract must be given in full. Unpublished results and personal communications are not recommended in the reference list, but may be mentioned in the text. If these references are included in the reference list they should follow the standard reference style of the journal and should include a substitution of the publication date with either 'Unpublished results' or 'Personal communication'. Citation of a reference as 'in press' implies that the item has been accepted for publication.

**Web references**

As a minimum, the full URL should be given and the date when the reference was last accessed. Any further information, if known (DOI, author names, dates, reference to a source publication, etc.), should also be given. Web references can be listed separately (e.g., after the reference list) under a different heading if desired, or can be included in the reference list.

**References in a special issue**

Please ensure that the words 'this issue' are added to any references in the list (and any citations in the text) to other articles in the same Special Issue.

### **Reference management software**

This journal has standard templates available in key reference management packages EndNote (<http://www.endnote.com/support/enstyles.asp>) and Reference Manager (<http://refman.com/support/rmstyles.asp>). Using plug-ins to wordprocessing packages, authors only need to select the appropriate journal template when preparing their article and the list of references and citations to these will be formatted according to the journal style which is described below.

### **Reference style**

References should be arranged first alphabetically and then further sorted chronologically if necessary. More than one reference from the same author(s) in the same year must be identified by the letters "a", "b", "c", etc., placed after the year of publication. **References should be formatted with a hanging indent (i.e., the first line of each reference is flush left while the subsequent lines are indented).**

*Examples:* Reference to a journal publication: Van der Geer, J., Hanraads, J. A. J., & Lupton R. A. (2000). The art of writing a scientific article. *Journal of Scientific Communications*, 163, 51-59.

Reference to a book: Strunk, W., Jr., & White, E. B. (1979). *The elements of style*. (3rd ed.). New York: Macmillan, (Chapter 4).

Reference to a chapter in an edited book: Mettam, G. R., & Adams, L. B. (1994). How to prepare an electronic version of your article. In B.S. Jones, & R. Z. Smith (Eds.), *Introduction to the electronic age* (pp. 281-304). New York: E-Publishing Inc.

### **Submission checklist**

The following list will be useful during the final checking of an article prior to sending it to the journal for review. Please consult this Guide for Authors for further details of any item.

#### **Ensure that the following items are present:**

One author has been designated as the corresponding author with contact details:

- E-mail address
- Full postal address
- Telephone and fax numbers

All necessary files have been uploaded, and contain:

- Keywords
- All figure captions
- All tables (including title, description, footnotes)

Further considerations

- Manuscript has been 'spell-checked' and 'grammar-checked'
- References are in the correct format for this journal
- All references mentioned in the Reference list are cited in the text, and vice versa
- Permission has been obtained for use of copyrighted material from other sources (including the Web)
- Color figures are clearly marked as being intended for color reproduction on the Web (free of charge) and in print, or to be reproduced in color on the Web (free of charge) and in black-and-white in print
- If only color on the Web is required, black-and-white versions of the figures are also supplied for printing purposes

For any further information please visit our customer support site at <http://support.elsevier.com>.



## Appendix 2: Letter of ethical approval



School of Health in Social Science  
Medical School, Teviot Place  
Edinburgh  
EH8 9AG

Telephone: 0131 650  
Fax: 0131 650 3891

Email:

Charlotte Williams  
Trainee Clinical Psychologist  
Child & Adolescent Mental Health Services  
The Phoenix Centre  
Raigmore Hospital  
Inverness

11/01/2012

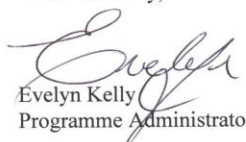
Dear Charlotte,


**Re: Research project: 'Post- traumatic stress following childbirth and maternal perceptions of the mother-infant relationship: the role of attachment experiences and metacognition'**

Many thanks for submitting the above research project for review by the Clinical Psychology Ethics Research Panel. I can confirm that the submission has been independently reviewed and was approved on the 10<sup>th</sup> January 2012. Should there be any change to the research protocol it is important that you alert us to this as this may necessitate further review.

With best wishes,

Yours sincerely,

  
Evelyn Kelly  
Programme Administrator



## **Appendix 3: Survey minus standardised questionnaires**

### **Posttraumatic stress after childbirth and the mother-baby relationship**

Page 1 of 11

#### **Welcome to the survey**

I am looking for volunteers to take part in a research survey.

Volunteers should be mothers who:

- Are aged 18 years or over
- Have a baby aged less than 12 months
- Have different types of birthing experiences

You do not need to have experienced a difficult or traumatic birth to take part

The survey can be saved part way through and takes around 20 minutes to complete. All data collected will be held securely. Cookies, personal data stored by your Web browser, are not used in this survey.

Please select CONTINUE for further information on the study and to take part.

Note that once you have clicked on the CONTINUE button at the bottom of each page you cannot return to, review or amend that page

CONTINUE

#### **Participant information: Please read this information before deciding whether to take part in the survey**

Researcher: Charlotte Williams, Doctoral Student in Clinical Psychology, University of Edinburgh

You are invited to take part in a research study. Before you decide whether to participate it is important that you understand why the research is being done and what it will involve. Please read the following information carefully and discuss it with anyone you choose.

Please do not hesitate to contact me if anything is unclear or if you would like more information. Thank you for reading this.

Top of Form

**What is the purpose of the study?** I would like to find more out about whether experiencing posttraumatic stress following childbirth affects the mother-baby relationship in the first postnatal year. I am also interested in how a mother's thinking patterns and own experiences of being parented relates to this. I am looking for mothers with a baby

aged under 12 months to complete six online questionnaires.

Mothers with a variety of birthing experiences can take part in the study. You do not have to have had a difficult or traumatic birth experience. You should be aged 18 or over to participate.

**Do I have to take part?** It is up to you to decide whether or not to take part. If you decide to take part, you will be asked to give your consent online before proceeding with the survey. You are free to withdraw from the study at any point, even if you have started to answer the questionnaires. This will not have any negative consequences or affect any services you receive. To withdraw you can close the survey at any time or decide not to submit the survey once all questions have been answered.

**What will happen if I agree to take part?** If you agree to take part then you will be asked to complete 6 short online questionnaires. You will not be asked to do anything else. Completing the questionnaires should take between 10 and 20 minutes. The questionnaires will ask: some basic background information about you, the birth and your baby; about how you have been feeling recently; about your own recollections of being parented; about your thoughts and worries; and about your relationship with your baby. Your answers will be submitted when you press the 'continue' link after you complete the last question. You will be informed when you are at the last question.

You will have the option to finish the survey at a later time. If you select this option, you will be asked to provide your email address and a reminder email will be sent to you. This email address will not be saved or linked with your responses. If you close the survey without saving it then your responses will be lost.

If you take part you will have the opportunity to enter a prize draw to win one of three £50 vouchers for Marks & Spencers. If you decide to enter this, you will be asked to provide your email address. Prize draw winners will be selected once the survey has been closed. Winners will be contacted via email.

Your questionnaire responses will be stored securely and will not be accessed by anyone other than the researcher. Your results will be considered alongside all other participant responses and not reported on individually. Once the study is complete, a summary report will be available on the website where you accessed information on the study. You will also be given the option to be emailed the summary report.

**What are the possible benefits in taking part?** It is not expected that there will be any direct benefits to you for participating in this research although you may find it interesting. I hope the study will improve understanding of how psychological distress

after childbirth may affect the mother-baby relationship. This information should help to contribute to existing research to inform postnatal services. It could help to make an argument for support and resources.

**What are the possible disadvantages of taking part?** If women have experienced a traumatic birth or have some difficulties in their relationship with their baby, then thinking about this could be upsetting. Contact details for helpful organisations are provided should participants feel distressed.

**Will my taking part in this study be kept confidential?** Your responses will be kept completely confidential. You will not be required to provide your name, address or identifiable information about your baby. We will not know your IP address (which can be used to locate your computer) when you respond to the online survey. However this information will be stored by the survey administrator. They will not share this information with any other parties, including us. If you provide your email address (for the prize draw and/or summary report) this will not be accessed alongside your responses or linked to your responses in any way. Your individual questionnaire responses and email address will not be shared with any organisations.

**What will happen to the results of the research study?** If you would like a summary report of the study findings emailed to you, please select this option and provide your email address. Alternatively, the summary report will be provided to all organisations who have posted study information on their website. You should be able to access the findings through them. The findings will be presented to interested services e.g. in the NHS. The results may also be shared with wider services through research publications and conferences.

**Who has reviewed this study?** This research project has been reviewed by the University of Edinburgh Clinical Psychology Programme team.

**Contact for further information.** If you would like to know a bit more about this study before deciding whether to take part, you can email me (Charlotte Williams) on [charlotte.williams1@nhs.net](mailto:charlotte.williams1@nhs.net) . If you wish to have a telephone discussion, please provide your contact details and I will phone you back as soon as possible.

My supervisors on this project are:

- ♣ Matthias Schwannauer , Clinical Psychology Course Director, University of Edinburgh
- ♣ Emily Taylor, Lecturer in Clinical Psychology, University of Edinburgh
- ♣ Rachel Smith, Clinical Psychologist, NHS Highland

If you would like to discuss the research with someone independent of the study, please

contact Heather Wilkinson, Director of Research and Knowledge Exchange, School of Health in Social Science, email [h.wilkinson@ed.ac.uk](mailto:h.wilkinson@ed.ac.uk), or telephone 0131 651 1832.

If you would like to take part in the study, please select CONTINUE to complete the consent form and the questionnaires .

Charlotte Williams  
Trainee Clinical Psychologist  
University of Edinburgh

Thank you for taking the time to read this.

Continue >

## Consent form

Project title: Posttraumatic stress after childbirth and the mother-baby relationship

Researcher: Charlotte Williams, Doctorate in Clinical Psychology, Postgraduate Student, University of Edinburgh

Please read each of the following statements carefully and then select the box alongside to show that you agree. Please contact me if you have any questions ([charlotte.williams1@nhs.net](mailto:charlotte.williams1@nhs.net)).

1. I can confirm that I have read and understood the information for the above study  
YES
2. I have had the opportunity to consider the information and ask questions. I have had any questions answered satisfactorily. YES
3. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason. YES
4. I understand that my data will be stored securely and will not be shared with any third parties  
YES
5. I agree to take part in the above study. YES
6. DATE (ENTER)

Please select CONTINUE to proceed with the survey

If you would like information on supportive organisations and telephone helplines then right click on this link (<https://www.survey.ed.ac.uk/orginfo>). This information will be provided again at the end of the survey.

CONTINUE

## **Questionnaire 1: Demographics & Obstetric information**

Please respond to all items.

### **Questionnaire 1: Demographics**

#### **Information about you**

1. Please enter your age: (years)
2. Please select your country of residence/ geographic location
3. Please select the option which best describes your ethnic group or background:

##### **White**

1. British
2. English
3. Northern Irish
4. Scottish
5. Welsh
6. Gypsy or Irish Traveller
7. Any other white background, please describe

##### **Mixed/ Multiple ethnic groups**

1. White and Black Caribbean
2. White and Black African
3. White and Asian
4. Any other Mixed/Multiple ethnic background, please describe ( )

##### **Asian/ Asian (British/English/ Scottish Welsh/ Northern –Irish)**

1. Indian
2. Pakistani
3. Bangladeshi
4. Chinese
5. Any other Asian background, please describe (----

Black/African/Caribbean/ Black British

1. African
2. Caribbean
3. Any other Black/African/ Caribbean background, please describe (...)

Other ethnic group

1. Arab
2. Any other ethnic group, please describe

4. What is your current marital status?

Co-habiting

Separated

Divorced

Single

Married / Civil partnership

Would rather not say

5. How many total years have you spent in education?

6. Including this baby, how many children have you given birth to?

One– this is my first baby

Two children

Three or more

**Information about your baby**

1. What is your baby's gender :      Male      Female

2. Please enter your baby's age: \_\_\_\_ months and \_\_\_\_ weeks

**Information about the birth**

1. At how many weeks gestation was your baby born?

Before 29 weeks (Extremely premature)

29-34 weeks (Very premature)

35- 37 weeks (Moderately Premature)

37-42 weeks (Full term)

Over 42 weeks (Overdue)

2. What kind of delivery did you have?  
Vaginal delivery with no intervention

Forceps/ Ventouse

Emergency caesarean

Planned caesarean

3. Where there any complications at the birth? Yes / No

4. After birth, did your baby receive care in hospital Yes/ No  
If yes, how many days were they incubated for?

Page 10 of 11

### **Contact details for prize draw and summary report**

By selecting 'CONTINUE' at the bottom of this page, your responses for the survey will be submitted

You now have the option to enter a prize draw to win one of three £50 vouchers for Marks & Spencer's. Winners will be selected randomly once the survey has been closed.

Top of Form

If you would like to enter the prize draw then please provide your email address below.  
Winners will be contacted by email.

Once the study is complete then a summary report will be available to all participants. If you would like a copy of this sent to your email address then please select this option. Alternatively you should be able to access a copy through the organisation where you accessed this survey or my emailing the researcher at a later date (charlotte.williams1@nhs.net).

Your email address will not be linked to your responses and will not be shared with any third parties.

125. My email address is (optional) :



126. I would like to enter the prize draw            YES    NO

127. Please email me a copy of the summary report    YES    NO

This is the last question. By selecting 'CONTINUE' your questionnaire responses will be submitted.

THANK YOU FOR COMPLETING THE SURVEY

Your responses have now been submitted

Some of the issues we have asked about can be upsetting. If you have felt distressed about any of the issues raised you may wish to discuss this with an adult who you can trust.

If you recognise any symptoms of posttraumatic stress or postnatal depression, we recommend that you contact your GP or health visitor to discuss this further. They will be able to provide professional advice and support.

Please find below contact information about supportive organisations which you may find helpful for information, advice and support. Some of these organisations specialise with working with women affected by emotional distress, a difficult or traumatic birth or postnatal depression. The list includes several helpline numbers.

You can access this same list at the beginning of the survey (before you give consent). To print this information, first copy and paste it into a word document.

Top of Form

### **Supportive organisations**

Please find below the details of Helplines and supportive organisations which you may find useful to access information, advice and support.

If you recognise symptoms of posttraumatic stress or postnatal depression and would like to discuss this with a health professional, please contact your GP or health visitor.

#### **Helplines**

NHS24 (<http://www.nhs24.com/>)

08454 24 24 24 (landlines charged at local rate, mobile charges vary)

Textphone: 18001 08454 24 24 24

For any concerns about your child's health, or the health of any family member. Staffed by a team of nurses who offer information and advice, including

information about local and national self-help and support groups.

Open: 24 hours a day, 7 days a week

Breathing Space (<http://www.breathingspacescotland.co.uk/>)

0800 83 85 87 (free from a landline, mobile charges vary)

If you're feeling down, depressed, worried or anxious and need to talk to someone during the evening or night call Breathing Space.

Open: Mon to Fri, 6pm-2am; weekends 6pm-6am

Samaritans (<http://www.samaritans.org/>)

08457 90 90 90 (landlines charged at local rate, mobile charges vary)

Emotional support, for people who are experiencing feelings of distress or despair, including those which could lead to suicide.

Open: 24 hours a day, 7 days a week

Lone Parent Helpline

0808 801 0323 (free from a landline, mobile charges vary)

For any single parent needing information or advice, including personalised benefit calculations, information about returning to work and childcare, factsheets and local sources of help.

Open: Mon to Fri 9.30am-4.30pm

Scottish Domestic Abuse Helpline

0800 027 1234 (free from a landline, mobile charges vary)

If you or someone you know is affected by domestic abuse, you can phone the Scottish Domestic Abuse helpline for information and support. Calls are answered by women with training in all aspects of domestic abuse. Records of calls will not appear on your phone bill.

Open: 24 hours a day, 7 days a week

Relationship and Stepfamily Helpline

0845 122 8655(landlines charged at local rate, mobile charges vary)

Support and information to strengthen and improve your relationships and family life..

Open: Mon to Thur 12pm-4pm

Parentline Scotland

0800 028 2233

Help and support for any adult who is caring for a child,

Open from 9am to 5pm on Monday, Wednesday and Friday; 9am to 10pm on Tuesday and Thursday; and 12 noon to 8pm on Saturday and Sunday.

Support for traumatic birth experiences

Birth Trauma Association (<http://www.birthtraumaassociation.org.uk/>)

The Birth Trauma Association (BTA) supports women suffering from Post Natal Post Traumatic Stress Disorder (PTSD) or birth trauma. BTA are not trained counsellors or therapists or medical professionals. They are mothers who wish to support other women who have suffered difficult births. They aim to offer advice and support to all women who are finding it hard to cope with their childbirth experience.

The BTA is the only organisation in the UK which deals solely and specifically with this issue. They aim to tackle the problem with work which is focused on three main areas:

- (1) Raising awareness of birth trauma
- (2) Working to prevent it
- (3) Supporting families in need

They have an online email support from volunteers & facebook group

The Baby Centre (<http://www.thebabycentre.uk>)

The baby centre is a UK pregnancy and parenting website. It offers information, advice and support. The baby centre has the following support group/ chat rooms:

- Traumatic Birth Support Group - Babycentre (websitelink)

A place to share your experiences and get support from people who have also had a difficult or traumatic birth.

- Post Traumatic Stress Disorder (PTSD) - Babycentre (website link)

A place to share your experiences and get support from people who have also suffered with PTSD following childbirth.

- Difficult Birth Debriefing Board - Babycentre Bulletin Board ([website link](#))

A web 'community' used by many BTA supporters to discuss ongoing issues after birth. The women are very friendly. They are aware of how tough and isolating it can be dealing with the aftermath of a traumatic or difficult birth and offer great advice and support. You need not be alone!

Websites of other organisations which may be helpful

Association for Improvements in Maternity Services (<http://www.aims.org.uk/>)

Provide information about birth and are happy to receive feedback from women about their experiences. Provide advice about how to complain about hospital treatment.

ASSIST (<http://www.traumatic-stress.freemove.co.uk/webstart.htm>)

ASSIST is a registered charity dedicated to offering confidential, emotional and practical support to individuals and families affected by trauma

They also have a helpline : +44 (0)1788 560800

Birth Crisis (<http://www.sheilakitzinger.com/BirthCrisis.htm>)

Information and access to the 'birth crisis' network who offer reflective listening

BLISS (<http://www.bliss.org.uk/>)

BLISS is a premature baby charity dedicated to ensuring that babies get the best care whenever they are born and that their parents and families get the support they need.

Doula UK (<http://doula.org.uk/>)

A non-profit organisation, this is a network of doulas run voluntarily by doulas.

Its aims are to promote the role of doulas, improve communication between doulas, and to advance understanding of birth and the postnatal period

House of light (<http://www.pndsupport.co.uk/>)

House of Light is a registered charity which provides support, advice and information for women and their families affected by Postnatal Depression

Telephone helpline: 0800 043 2031 (Monday -Friday 9am-5pm)

They also offer email support: [help@pndsupport.co.uk](mailto:help@pndsupport.co.uk).

MIND ([www.mind.org.uk](http://www.mind.org.uk))

MIND are a national mental health organisation who provide high-quality information and advice, and campaign to promote and protect good mental health for everyone.

Information helpline: 0300 123 3393

Email for information: [info@mind.org.uk](mailto:info@mind.org.uk)

Access MIND's information about postnatal depression here

: [http://www.mind.org.uk/help/diagnoses\\_and\\_conditions/post-natal\\_depression](http://www.mind.org.uk/help/diagnoses_and_conditions/post-natal_depression)

Mumsnet (<http://www.mumsnet.com/>)

This site has information and advice on all aspects of parenting. Mumsnet is an online network of parents pooling their knowledge on everything from how to get a baby to sleep through the night to the best places to go on holiday with a five-year-old.

The National Childbirth Trust (<http://www.nct.org.uk/>)

NCT offers support in pregnancy, childbirth and early parenthood. It aims to give every parent the chances to make informed choices.

Netmums (<http://www.netmums.com>)

This is a local network for Mums offering a wealth of information. Once you have registered on your local site you can access details for all kinds of local resources, from child-friendly cafes to childminders, places to go and more. You can also chat with local mums in the coffee house, read other mums local recommendations and check out information on pre-schools or schools in your area.

Postnatal Illness Org UK (PNI) (<http://www.pni.org.uk/>)

This is a mutual support and self help group for women who have suffered traumatic births and post natal illnesses.

Forum Direct link: <http://veritee.proboards7.com>

SANDS (<http://www.uk-sands.org/>)

SANDS works to support bereaved parents and families, and to press for improvements in care during pregnancy and when a baby has died.

Trauma and Birth Stress (***<http://www.tabs.org.nz/>***)

This New Zealand group have information on birth trauma

THANKS AGAIN

#### **Appendix 4: Recruitment messages**

**Would you like to take part in a study investigating how emotional wellbeing after difficult birth experiences may relate to the mother–baby bond?**

Hi, my name is Charlotte and I am a Trainee Clinical Psychologist at the University of Edinburgh. I am looking for mothers who have given birth in the last twelve months, with all different types of birthing experiences to take part in an online survey.

For further information, to take part in the survey and for a chance to win one of three £50 vouchers for Marks & Spencers please visit the link

*<https://www.survey.ed.ac.uk/ptsmotherbaby>*

Thanks for your time

*Charlotte*

**Would you like to take part in a study investigating how emotional wellbeing after difficult birth experiences may relate to the mother–baby bond?**

**My name is Charlotte Williams and I am a Clinical Psychology trainee at the University of Edinburgh. I am looking for mothers with all different types of birthing experiences to take part in an online survey. The survey takes around 20 minutes to complete.**

**For further information, to take part in the survey and for a chance to win one of three £50 vouchers for Marks & Spencers please click visit *<https://www.survey.ed.ac.uk/ptsmotherbaby>***

## Appendix 6: Journal of Clinical Psychology Guidelines

### Manuscript Preparation

**Format** . Number all pages of the manuscript sequentially. Manuscripts should contain each of the following elements in sequence: 1) Title page 2) Abstract 3) Text 4) Acknowledgments 5) References 6) Tables 7) Figures 8) Figure Legends 9) Permissions. Start each element on a new page. Because the *Journal of Clinical Psychology* utilizes an anonymous peer-review process, authors' names and affiliations should appear ONLY on the title page of the manuscript. Please submit the title page as a separate document within the attachment to facilitate the anonymous peer review process.

**Style** . Please follow the stylistic guidelines detailed in the *Publication Manual of the American Psychological Association, Sixth Edition*, available from the American Psychological Association, Washington, D.C. *Webster's New World Dictionary of American English, 3rd College Edition* , is the accepted source for spelling. Define unusual abbreviations at the first mention in the text. The text should be written in a uniform style, and its contents as submitted for consideration should be deemed by the author to be final and suitable for publication.

**Reference Style and EndNote** . EndNote is a software product that we recommend to our journal authors to help simplify and streamline the research process. Using EndNote's bibliographic management tools, you can search bibliographic databases, build and organize your reference collection, and then instantly output your bibliography in any Wiley journal style. *Download Reference Style for this Journal*: If you already use EndNote, you can [download the reference style](#) for this journal. *How to Order*: To learn more about EndNote, or to purchase your own copy, [click here](#) . *Technical Support*: If you need assistance using EndNote, contact [endnote@isiresearchsoft.com](mailto:endnote@isiresearchsoft.com) , or visit [www.endnote.com/support](http://www.endnote.com/support) .

**Title Page** . The title page should contain the complete title of the manuscript, names and affiliations of all authors, institution(s) at which the work was performed, and name, address (including e-mail address), telephone and telefax numbers of the author responsible for correspondence. Authors should also provide a short title of not more than 45 characters (including spaces), and five to ten key words, that will highlight the subject matter of the article. Please submit the title page as a separate document within the attachment to facilitate the anonymous peer review process.

**Abstract** . Abstracts are required for research articles, review articles, brief reports, commentaries, and notes from the field. Abstracts must be 120 words or less, and should be intelligible without reference to the text.

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**Final Revised Manuscript** . A final version of your accepted manuscript should be submitted electronically, using the instructions for electronic submission detailed above.

**Artwork Files** . Figures should be provided in separate high-resolution EPS or TIFF files and should not be embedded in a Word document for best quality reproduction in the printed publication. Journal



quality reproduction will require gray scale and color files at resolutions yielding approximately 300 ppi. Bitmapped line art should be submitted at resolutions yielding 600-1200 ppi. These resolutions refer to the output size of the file; if you anticipate that your images will be enlarged or reduced, resolutions should be adjusted accordingly. All print reproduction requires files for full-color images to be in a CMYK color space. If possible, ICC or ColorSync profiles of your output device should accompany all digital image submissions. All illustration files should be in TIFF or EPS (with preview) formats. Do not submit native application formats.

**Software and Format** . Microsoft Word is preferred, although manuscripts prepared with any other microcomputer word processor are acceptable. Refrain from complex formatting; the Publisher will style your manuscript according to the journal design specifications. Do not use desktop publishing software such as PageMaker or Quark XPress. If you prepared your manuscript with one of these programs, export the text to a word processing format. Please make sure your word processing program's "fast save" feature is turned off. Please do not deliver files that contain hidden text: for example, do not use your word processor's automated features to create footnotes or reference lists.

## Article Types

- **Research Articles** . Research articles may include quantitative or qualitative investigations, or single-case research. They should contain Introduction, Methods, Results, Discussion, and Conclusion sections conforming to standard scientific reporting style (where appropriate, Results and Discussion may be combined).
- **Review Articles** . Review articles should focus on the clinical implications of theoretical perspectives, diagnostic approaches, or innovative strategies for assessment or treatment. Articles should provide a critical review and interpretation of the literature. Although subdivisions (e.g., introduction, methods, results) are not required, the text should flow smoothly, and be divided logically by topical headings.
- **Brief Reports** . Abbreviated reports will be considered, and are especially encouraged if they involve: 1) replications; 2) replication failures; 3) well-designed clinical trials and other studies with negative findings; 4) potentially interesting serendipitous findings or results obtained by post-hoc hypotheses; or 5) Dissertations in Brief (DIB). DIB is intended to encourage students to submit innovative research conducted during the student's graduate studies. It is expected that DIB manuscripts would be submitted by the student, who would be the first author. All Brief Reports should contain an abstract and provide a concise synopsis (12 manuscript pages or less) of the major findings presented in the study. The format of manuscripts submitted for Brief Reports may adhere to the Research Report or Review Article format as appropriate. Authors of Brief Reports should make available a full description of method and statistical analyses with a report of all data and information needed for meta analyses. Brief Reports should include explicit statements of limitation, and power analyses may be necessary.
- **Commentaries** . Occasionally, the editor will invite one or more individuals to write a commentary on a research report.

- **Editorials** . Unsolicited editorials are also considered for publication.
- **Notes From the Field** . Notes From the Field offers a forum for brief descriptions of advances in clinical training; innovative treatment methods or community based initiatives; developments in service delivery; or the presentation of data from research projects which have progressed to a point where preliminary observations should be disseminated (e.g., pilot studies, significant findings in need of replication). Articles submitted for this section should be limited to a maximum of 10 manuscript pages, and contain logical topical subheadings.
- **News and Notes** . This section offers a vehicle for readers to stay abreast of major awards, grants, training initiatives; research projects; and conferences in clinical psychology. Items for this section should be summarized in 200 words or less. The Editors reserve the right to determine which News and Notes submissions are appropriate for inclusion in the journal.

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